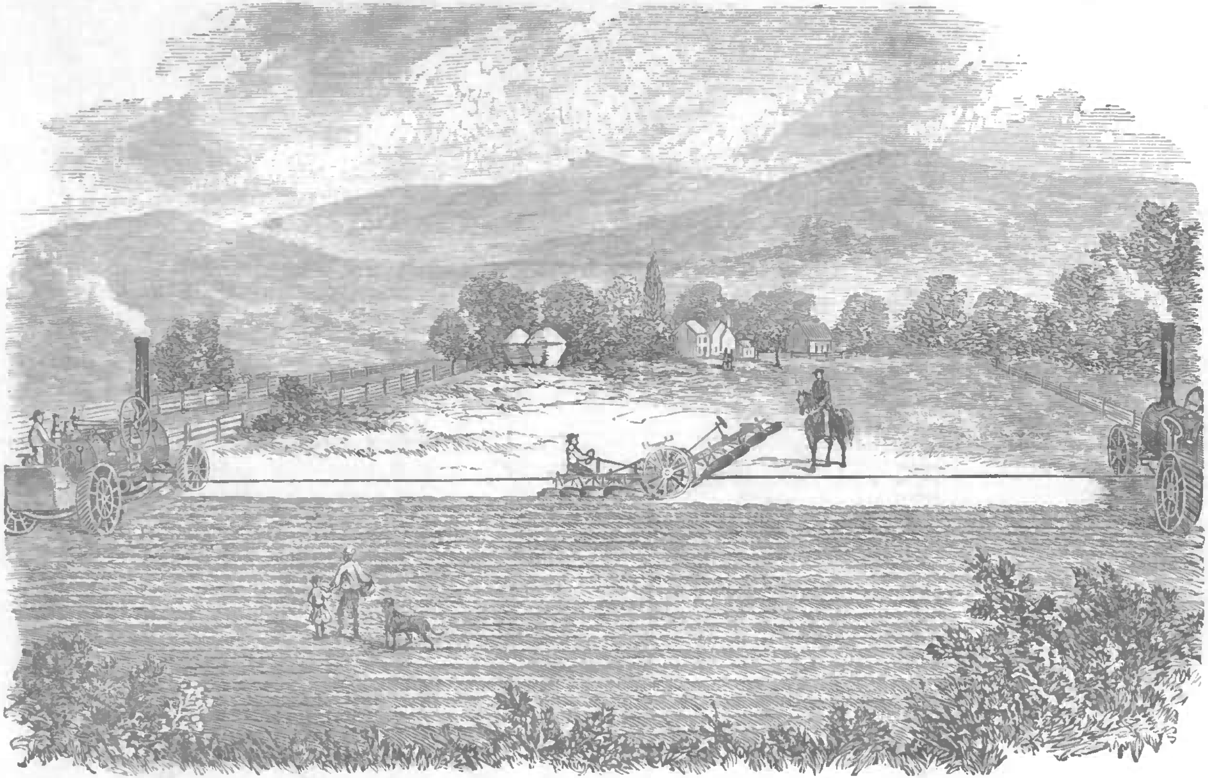

STEAM-PLOUGHING.

FRONTISPIECE.

REPORT

OF THE

COMMISSIONER OF AGRICULTURE

FOR

THE YEAR 1867.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1868.

IN THE HOUSE OF REPRESENTATIVES.

JUNE 30, 1868.

Resolved, That there shall be printed for the use of the members of the House of Representatives one hundred and eighty thousand extra copies of the annual report of the Commissioner of Agriculture for the year eighteen hundred and sixty-seven, and twenty thousand copies for the Commissioner of Agriculture.

IN THE SENATE OF THE UNITED STATES.

JULY 20, 1868.

Resolved, That there be printed for the use of the Senate twenty thousand extra copies of the agricultural report for eighteen hundred and sixty-seven, and three thousand extra copies for distribution by the Commissioner of Agriculture.

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ILLUSTRATIONS.

REPORT

OF THE

ACTING COMMISSIONER OF AGRICULTURE.

DEPARTMENT OF AGRICULTURE,
Washington, D. C., November 25, 1867.

SIR: In consequence of the death of the late Commissioner, Hon. Isaac Newton, which took place in this city on the 19th day of June last, it becomes my duty, by the terms of the organic act establishing this Department, to submit to you a report of its transactions for the past year. In so doing, it affords me great pleasure to be able to say that it has been a year of great productiveness and prosperity to the agricultural interest, and to the country.

The discouragement resulting from the diminished fruitfulness of preceding years has been partially relieved by a recurrence of a fair measure of productiveness. Another assurance has been added to the universal teaching of the past, that seed-time is followed by the harvest as sure as day is preceded by the dawn. It is this certainty of results in proportion to the measure of judgment and industry employed, that gives to husbandry its safety and stability, its freedom from preying anxieties, and its ability to supply the most pressing wants of the whole human family.

PROGRESS IN AGRICULTURE.

It is gratifying to note the evidences that are apparent even to the superficial observer of the increasing interest of our people in the advancement of agricultural science—of the quickened mental activities of farmers, as shown by the widening demand for agricultural books, newspapers, and the reports of this Department—of the disposition to experiment, test alleged, improvements, and adopt labor-saving expedients—of the growing inclination to employ in agriculture money, business energy, and active enterprise, which are so successfully employed in other departments of business.

In nothing is this intellectual activity shown to be so manifestly beneficent to the agriculture of the present era, as in the improvement of agricultural implements. In 1847, the number of agricultural patents granted was but 43; in 1863 it had increased to 390; in 1864 to 563; in 1865 to 642; while in 1866 the wonderful increase to 1,778 was made; and during 10 months of the present year the Patent Office has issued no less than 1,777. Thus the number of agricultural inventions perfected yearly is now more than forty-fold greater than 20 years ago. Already has this nation surpassed all others in the excellence and variety of its agricultural machinery. Partially represented as was our agricul-

ture in the recent world's exposition of industry, at Paris, and almost ignored officially in the national recognition of that great exhibition, our honors plucked from the field of European competition were almost exclusively industrial, and largely agricultural. So successful have been our farming implements in repeated contests on European soil, that their rapid introduction into foreign markets is only impeded by the greatly increasing demand at home. These improvements are rapidly revolutionizing the agriculture of the west, and reducing to the lowest minimum ever attained, the proportion of manual labor employed in its operations. As an instance, the reaper, first doing the labor of a half dozen, then a half score of men, is supplemented with a self-raker, which does the work of others still; and now, further to facilitate and economize the harvest work, the same machine is furnished with apparatus for instantaneous binding of the sheaves. And the further this labor-saving progresses, the higher the wages of harvest workers, the broader become the harvest fields, the greater are the profits of the farmer, and the more extensive become the garners of the world.

Coincident with this application of mechanics to agriculture, systematic and enlarged business aptitudes have also sought alliance with this noble art. Farms of thousands of acres have been managed with greater skill, a more economical adaptation of means to ends, and with a larger margin of net profit than many others of 80 acres. The maxim "cultivate fewer acres, and cultivate them better," is a safe one for farmers who can only be induced to cultivate better by a reduction of the area cultivated; but it will be found that the larger the farm, within the capacity and means of the farmer for good tillage, the better and cheaper it may be tilled. Yet it is true of the mass of farmers, who only employ the labor of their own hands, that the concentration of that labor upon a small area is their highest assurance of success.

It is a fact that cannot escape the attention of the observing, that men of culture and wealth are taking an interest in agriculture, giving to the world the benefit of their experience and research, and pursuing their vocation with a view to scientific results as well as profit. It has ceased to be a custom to select the dolt of the family for the business of farming. It is becoming apparent, even to the unintelligent, that agriculture involves principles underlying many sciences, and natural phenomena too deep for science to fathom; that it requires, in a merely practical view, a farmer to be something more than a ploughman—a machinist, to understand the construction, management, and care of farm machinery; a carpenter, to repair implements and manufacture many fixtures of the farm; a book-keeper, to keep an accurate record of the outgo and income, experiment, profit and loss; a merchant, to know how and when to buy and sell cattle, or dispose of the products of his labor; and a banker, to discover when drainage and fertilization will prove a better investment for surplus profits than five-twenties or railroad stock. In view of all these evidences of the progress and of the expanding capabilities of our agriculture, I take pleasure in commending this great interest to the favorable consideration of Congress, believing they will deal with it in a spirit of liberality becoming a great nation. The continued manifestation of governmental interest in this industry is assumed from the magnificent grants of public lands for "such branches of learning as are related to

agriculture and mechanic arts," the subject of which is fully set forth in the fourth section of said act, as follows:

SEC. 4. *And be it further enacted*, That all moneys derived from the sale of lands aforesaid by the States to which the lands are apportioned, and from the sales of land scrip hereinbefore provided for, shall be invested in stocks of the United States, or of the States, or some other safe stocks, yielding not less than five per centum upon the par value of said stocks; and that the moneys so invested shall constitute a perpetual fund, the capital of which shall remain forever undiminished, (except so far as may be provided in section fifth of this act,) and the interest of which shall be invariably appropriated by each State which may take and claim the benefit of this act, to the endowment, support, and maintenance of at least one college where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the legislatures of the States may respectively prescribe, in order to promote the practical and liberal education of the industrial classes in the several pursuits and professions in life.

The details of organization of these institutions in aid of scientific and intelligent husbandry has been wisely left to the control of the States, a majority of whose people are interested in the pursuits to be benefited, and therefore not disposed to permit these liberal donations to be misapplied. It is gratifying to note the increasing interest in agricultural education, which is evinced in discussions of the various plans of organization, and to discern the gradual crystallizing into form of the crude views at first entertained, all leading to the confident belief that a sublime development of practical industrial education, however slowly accomplished amid embarrassments and discouragements, will at length be acknowledged one of the crowning glories of America.

RETROGRESSION.

While adverting to these evidences of progress in American agriculture, it is proper to drop a word of dissatisfaction, and even utter a note of warning, in view of the improvidence and reckless waste which is stripping the fairest fields of their wealth of fertility, exposing them to the constant action of the elements, and subjecting them to an annual drain of the same constituents, none of which are ever returned to the soil. The Department estimate of the average production of wheat in Ohio last year was about four bushels per acre; the State statistics, so far as returned, made the yield scarcely three bushels. None will doubt that it is more owing to bad culture and want of drainage than to the severity of the season that the product did not average 20 bushels. Every new western State is remarkable for sounding reports of great crops of wheat, and the same States, in a very few years, are equally remarkable for reduction in yield of wheat, increase of insects, and prevalence of disease.

The freshest areas in this culture, east of California, will scarcely yield an average of 12 bushels per acre the present year. A systematic rotation, some attention to fertilization, greater care in the selection of seed, better tillage and more thorough culture, will alone prevent deterioration in products and real values of farm property. This stigma upon American agriculture may be attributed in part to the cheapness of western lands, the original price of which bears so insignificant proportion to their intrinsic value, that the owner erroneously deems it cheaper to remove to new lands than to sustain and increase the productive capacity of his present farm. One result of this fatal error is the removal westward, year by year, of the centre of wheat production, thus adding transportation and other

charges to its ultimate cost, threatening to make difficult the future supply of our population, and to render export impossible.

If we shall be able to produce our own supply of breadstuffs, with a surplus sufficient to prevent the operations of speculators, a failure to supply a foreign demand need occasion few regrets among the true friends of agriculture, for grain-growing for export is unquestionably the most illusory and least remunerative of agricultural operations; and its worst feature is the exhaustion of the soil which inevitably follows its culture in undue proportion to stock-raising. Western farmers are finding true the remark of the late Hon. Henry L. Ellsworth, made 20 years ago, that "the profits of wheat appear well in expectation, on paper, but the prospect is blasted by the appearance of insects, bad weather in harvesting, or transportation to market, or last, a fluctuation in the market itself;" and many are inclining to the belief of Lord Brougham, "that grazing countries are always the most prosperous, and their population the most contented and happy."

THE POLITICS OF AGRICULTURE.

The modest reserve and quiet independence of our rural population have heretofore barred the great interest of agriculture from its proper prominence in the legislation of the country; while other interests, more active and clamorous, with the advantages of association, abundant means, and concentrated effort, have often secured special protection at the expense of the farmer. Unfortunately this disinclination to self-seeking, and lack of ambition for public station, result too generally in the selection from towns and cities of national legislators, from other avocations, some of whom have little knowledge of the peculiar wants of the farming class, and many others may have connection with other interests that may be brought into frequent antagonism with those of agriculture. Farmers are learning their power, and are beginning to exercise it in self-protection, if not for their own advantage; and their interests are now more clearly understood and more fully represented in legislative councils than at any former period.

RAILROADS.

The railroad interest has secured, among other favors and franchises of the government, grants of public land, amounting to 184,000,000 acres, in aid of lines extending in all directions, to the borders of civilization, under the plea of furnishing facilities for travel and transportation of the fruits of agriculture and the products of mines; and the results have been seen in extended settlement and expanding cultivation; yet growing stronger, disregarding the general welfare, these monopolies have combined, in their tariff of rates, to discriminate unfairly against farm products, and to require much the larger portion of the value of the crops for their transportation to market. So onerous is this burden, that the cost of transportation of wheat from Chicago, and other western centres, to the Atlantic cities, is greater than from San Francisco, via Cape Horn, to the same points. It is hoped that the attention of rural voters to this subject may ultimately correct this evil, which proves so serious a drawback to their industry; but it can only be accomplished by untiring vigilance over State legislation,

and by securing the enactment of laws that shall restrain these corporations from the absorption of the entire products of the farm, instead of allowing them to control the legislation of the country against the best interests of the people, and especially to the detriment of the consumer, who is made to pay tribute to this combination, which breaks down a fair competition incidental to all other classes and associations in the business of life.

In this connection I desire to express the hope that Congress may devise and perfect some plan for facilitating the early construction of a ship canal for the transportation of western products from the lakes to the ocean, or for the building of a double track freight railway, open to all, forwarding on equal terms, and supported by an equitable system of tolls.

THE WOOL INTEREST.

The wool-growing interest, involving a capital of hundreds of millions, and underlying the prosperity of American agriculture in a degree scarcely appreciated by farmers themselves, has been saved from threatened annihilation by the action of Congress in placing a duty upon the foreign article equivalent to the internal taxation endured by the wool-growers, though not until the commercial class, taking advantage of the tardy progress of the measure, had inflicted a heavy blow in the introduction of more woollens in a single year than were imported in three years of the late war. It is to be hoped that a premium will never again be given to foreign production, either of wool or woollens, by imposing a higher tax upon American than upon foreign wool-growers, and that the present moderate and harmonious adjustment, barely saving the two classes of producers from loss, and consumers from becoming the ultimate prey of foreign monopolists, may long be undisturbed, even by the threat of agitation for repeal. Our wool production is now more than equivalent to two thirds of a full supply, and with an increase of worsted wools, already initiated and progressive, and more attention to the finer varieties of clothing wools, there will scarcely be occasion for any imports whatever, with the exception of coarse carpet styles, complete provision for which exists at a nominal rate of duty. It is a manifestly false system of political economy in a nation with a continental domain, having unmeasured resources of annual growth running to waste, that sends abroad for the raw materials of manufacture; and it is scarcely less unwise in a teeming population, demanding various employment, to send from the country these unwrought productions, which we are amply able to manufacture for the markets of the world.

SOUTHERN AFFAIRS.

The unsettled condition of the industry of the southern States requires the encouraging aid and friendly recognition of the government to restore the people to a state of prosperity and self-reliance, so essential to the development of the great resources of that section. There is every evidence of a fixed and determined purpose of the people to adapt themselves to the changes produced by the result of the late war. I am confident that the change in the labor system of these States, radical as it has been, will ultimately prove a great and permanent

benefit, which none will be more ready to acknowledge than those affected by it; and that the least apprehension of an attempt to revive the system of slavery is entirely groundless. By no means can a settled and well-grounded conviction of this fact be so readily realized as by promptly and emphatically disabusing the minds of the freedmen (at present unsettled and disturbed) of anticipations of dividends of confiscated estates; and the delusions of political preferment. With ample protection of his civil rights and privileges, the increasing demand for his labor, at remunerating wages, will make his presence not only acceptable but desirable; antagonism of capital and labor will cease, and the laborer of to-day, with the accumulations of his industry and economy, becomes the proprietor of to-morrow.

A portion of the people have been influenced by more potent causes for discouragement than political failure, and the change in the relations of labor. Reduced to almost hopeless poverty by the exactions and vicissitudes of war, many thousands of the poor of these sections, during the early part of the present year, suffered great distress and absolute want, which excited the sympathy of the benevolent in the north, and secured food supplies for temporary relief.

The distribution, under the special appropriation of fifty thousand dollars, to be expended in seeds for these States, was promptly and fully made in accordance with the views and intentions of Congress, through special agents, sent through the southern States, postmasters, prominent citizens, and the officers and agents of the Freedmen's Bureau. Although authorized late in the season, the information received by the Department has been entirely satisfactory as to the result produced by this liberal and timely donation.

These States possess decided natural advantages over the northern and western sections in their ability to produce every article which may be grown in the higher latitudes, with the almost exclusive advantage of producing cotton, hemp, rice, sugar, and other products of the lower temperate zone. With longer shore-lines than any other section of the continent, facilities are furnished for coastwise and inland navigation to the whole tide-water area, which is endowed with a climate peculiarly adapted to market gardening, with forests abounding in the most valuable timber, and waters teeming with edible fishes and crustacea. Florida is destined to be a winter garden, yielding market supplies to northern cities without a risk of competition, and oranges, figs, and olives, and other fruits of sub-tropical climes. Between tide-water and the lower slopes of the mountains is a region producing wheat of a better quality than that of any section north of it, the entire range of farm products in great profusion, and such fruits as apples, cherries, and grapes, with certainty and success. The mountain region, almost unappropriated and unknown, at an elevation varying from 1,500 to 6,000 feet, is the great grazing section of North America, sufficient to furnish abundant pasturage through the year to millions of cattle and sheep. These mountain slopes are generally free from surface rocks, covered with forest growths interspersed with grassy glades, and fertile to their summits. In bodies of thousands of acres, these pastoral areas await the advent of the dairyman, the wool-grower, and the herdsman, at prices not exceeding those of the public lands of the distant west; and even on the eastern aspect of the Blue Ridge, in prox-

imity to railroads and near to great markets, whole counties together have little more than ten per cent. of their territory in a state of nominal improvement.

There are grounds for assuming, also, that this must ultimately become the great wine-producing section of the country; for observation and experience fully attest that the higher, colder, and more humid latitudes will not ripen to perfection the wine-producing grape. It being now a well-settled fact that wine can be made in this country equal to the best that can be imported, we have only to select a region of our great country where the climate is perfectly adapted to grape culture, to be independent of the world for our wine supplies.

Examination of the following table will show the extent of land not included in farms in the several States:

States.	Improved land in farms.	Unimproved land in farms.	Wild or waste areas not in farms.	Number of farms.	Average number of acres in each farm.
Alabama	6, 385, 724	12, 718, 821	13, 357, 535	55, 128	346
Arkansas	1, 983, 313	7, 590, 393	23, 833, 014	39, 004	245
California	2, 468, 034	6, 262, 000	112, 219, 086	18, 716	666
Connecticut	1, 830, 807	673, 457	487, 096	25, 180	99
Delaware	637, 065	367, 230	352, 505	6, 658	151
Florida	654, 213	2, 266, 015	35, 011, 292	6, 568	444
Georgia	8, 062, 758	18, 587, 732	10, 461, 510	62, 003	430
Illinois	13, 096, 374	7, 815, 615	14, 550, 411	143, 310	146
Indiana	8, 242, 183	8, 146, 109	5, 249, 468	131, 826	124
Iowa	3, 792, 792	6, 277, 115	25, 158, 893	61, 163	165
Kansas	405, 468	1, 372, 932	50, 265, 130	10, 400	171
Kentucky	7, 644, 208	11, 519, 053	4, 951, 939	90, 814	211
Louisiana	2, 707, 108	6, 591, 468	17, 162, 864	17, 328	536
Maine	2, 704, 133	3, 023, 538	13, 472, 329	55, 698	103
Maryland	3, 002, 267	1, 833, 304	1, 152, 269	25, 494	190
Massachusetts	2, 155, 512	1, 183, 212	1, 653, 276	35, 661	94
Michigan	3, 476, 296	3, 554, 538	29, 097, 806	62, 422	113
Minnesota	556, 250	2, 155, 718	50, 747, 872	18, 181	149
Mississippi	5, 065, 755	10, 773, 929	14, 340, 156	42, 840	370
Missouri	6, 246, 871	13, 737, 939	21, 839, 190	92, 792	215
Nebraska	118, 789	512, 425	48, 000, 375	2, 789	226
Nevada	14, 132	41, 986	71, 681, 623	91	617
New Hampshire	2, 367, 034	1, 377, 591	2, 194, 575	30, 501	123
New Jersey	1, 944, 441	1, 039, 084	2, 341, 275	27, 646	108
New York	14, 358, 403	6, 616, 555	9, 105, 042	196, 990	106
North Carolina	6, 517, 284	17, 245, 685	5, 037, 031	75, 203	316
Ohio	12, 625, 394	7, 846, 747	5, 104, 829	179, 889	114
Oregon	896, 414	1, 164, 125	58, 914, 821	5, 806	355
Pennsylvania	10, 463, 296	6, 548, 844	12, 427, 860	156, 357	109
Rhode Island	335, 128	186, 096	314, 616	5, 406	96
South Carolina	4, 572, 060	11, 623, 859	2, 610, 481	33, 171	488
Tennessee	6, 795, 337	13, 873, 828	8, 514, 835	82, 368	251
Texas	2, 650, 781	22, 693, 247	126, 541, 412	42, 891	591
Vermont	2, 823, 157	1, 451, 257	1, 522, 426	31, 556	135
Virginia	11, 437, 821	19, 679, 215	8, 148, 244	92, 605	324
Wisconsin	3, 746, 167	4, 147, 420	26, 717, 773	68, 270	114
	162, 782, 769	242, 498, 082	834, 548, 859	2, 033, 665	199

It will be seen that the southern States vie with the distant west in extent of unoccupied lands. They show an area, not in farms, amounting to nearly 300,000,000 acres, nearly two-thirds as much more "unimproved" in farms, and less than 75,000,000 nominally improved, which is but thirteen per cent. of the whole, and not half of this in actual cultivation. It is safe to say that little more than five per cent. of the area of the south is annually cultivated.

An imperative and immediate necessity of rescinding the cotton tax must be apparent to all. The reduction of more than one-half of the value of this fibre,

in connection with labor contracts, and other expenses upon the basis of high prices, is disastrous and disheartening in the extreme. A tax of 20 per cent. *ad valorem* upon one of the raw products of agriculture, which has not paid the expenses of culture, must be destructive to all enterprise and effort in the producer, and yet many a cotton planter will fail to realize a more cheering state of facts at the close of the year's operations; and it will stimulate the efforts of the British cotton supply associations, which have increased the India yield, by the aid of the war and our own taxation, nearly four-fold in eight years, and that of Brazil at about the same rate. Ten years ago the contribution of the United States to the European supply was fully four-fifths of the total amount; now it is considerably less than the receipts from other sources. During ten months of 1867, the imports into Great Britain were as follows:

	Pounds.
From Brazil	504, 284
From Egypt	591, 398
From India and China	2, 968, 557
From the United States	4, 188, 094
From other quarters	292, 000
Total	8, 544, 333

The following table shows the rate of increase in the production of competing countries, stated in bales—those of the United States averaging 441 pounds, of Egypt 490, India and China 360, and Brazil 174 pounds.

Year.	United States.	Brazil.	Egypt.	India & China.	Miscellaneous quarters.	Total.
	Bales.	*Bales.*	*Bales.*	*Bales.*	*Bales.*	*Bales.*
1859	2, 086, 000	125, 000	101, 000	510, 000	7, 000	2, 829, 000
1860	2, 580, 000	103, 000	110, 000	563, 000	10, 000	3, 366, 000
1861	1, 841, 000	100, 000	97, 000	986, 000	11, 000	3, 035, 000
1862	72, 000	134, 000	132, 000	1, 072, 000	35, 000	1, 445, 000
1863	132, 000	138, 000	204, 000	1, 391, 000	67, 000	1, 932, 000
1864	198, 000	212, 000	257, 000	1, 798, 000	122, 000	2, 586, 000
1865	462, 000	340, 000	334, 000	1, 407, 000	211, 000	2, 754, 000
1866	1, 162, 745	407, 646	167, 451	1, 866, 600	144, 600	3, 749, 042

It is not probable that a monopoly in cotton production will be regained, nor is it desirable that it should be. The cotton of this country is of superior quality, and should be manufactured largely where it is grown; any surplus of the raw material would then command remunerative prices abroad, and the cotton interest would still be independent of foreign combinations, and far more prosperous than in the time when planters made more purchases annually than the proceeds of their cotton would cover. The factories would make a demand for the labor of women and children, and furnish markets which would stimulate a widened range of agricultural production, making requisite and inevitable a largely increased population, and ultimately resulting in larger crops of cotton than in the boasted days of our cotton supremacy.

The solution of the labor question in the cotton States is anxiously awaited by the people. The recent radical change of the system of labor has necessarily been attended with irregularities, especially in the working of large plantations, and has led to disappointments and discouragements; and the operations of the future will undoubtedly be conducted on a smaller scale by a larger number of proprietors. No body of laborers of whatever race or degree of intelligence, if free to contract for their own service, can be held in one locality, or one branch of industry, or prevented from attempts, however weak or unsuccessful, to assume the part of proprietor. The negroes of the South have exhibited such restlessness, and evinced a similar ambition, to the annoyance of the contractors for their labor; yet in many cases their employers have accorded to them a character for stability and industry that was scarcely to be expected. Time alone will settle these disturbed conditions; and patience and experience in adjustments to new circumstances on the part of employers and employés will aid materially in the settlement.

The introduction of Asiatics to meet the requirements of cotton production is to be deprecated, not only because such labor is unskilled and far inferior to negro labor, but it will add to the complications produced by the jealousies and prejudices of races widely differing in character, taste, and traditional customs. The assumed disadvantage in the presence of one inferior race cannot be neutralized by the introduction of another.

As a result of the doubt relative to the action of the negro, the white man has undertaken the solution of the labor question, and is successfully producing cotton, both by co-operative and individual enterprises, proving to the world that the Caucasian can labor without detriment to health under a southern sun, and laying the foundation for universal industry and general thrift.

There is unexampled activity throughout this section in search of new branches of production, and the fostering care of the government in aiding the acquisition of new fruits, grasses, and fibres, and in furnishing information calculated to facilitate experiments, correct injurious misapprehensions, and render these activities successful, will be rewarded by the return of prosperity to a great section, and in a development that will enrich the country and astonish the world.

STOCK IMPORTATION.

The cattle plague, or rinderpest, having almost, if not entirely, disappeared in Europe, it will become necessary to repeal or modify the law prohibiting the importation of cattle, no cases having appeared in England for some weeks, and notice having been given that no more reports will be made. Stock-growers of this country desire, after so long prohibition of importation, to avail themselves of an opportunity for judicious selection of favorite strains of blood, and to secure the result of recent improvements.

DEPARTMENT OPERATIONS.

The limited appropriations heretofore made to this Department have merely enabled it to inaugurate a plan of operations designed to further the interests of intelligent husbandry, and protect it in its economic and political relations with

other industries. Constantly accumulating evidence of the interest awakened among farmers in these efforts in behalf of agriculture attests the vitality and utility of this branch of the government service. Special information, involving scientific, technical, and practical knowledge, is sought with great avidity by individuals and associations, and by directors and promoters of emigration and official boards of agriculture in foreign countries; and the monthly and annual reports are yearly received with increasing appreciation.

The system of crop estimates, initiated as an experiment, and furnishing only approximate results in the absence of a complete census of production, have proved sufficiently reliable to excite the ire of speculators, whose purposes are frequently foiled by their publication. In the case of cotton, the only product of which an annual enumeration is attainable, the estimate of last year, of 1,835,000 bales, was strikingly verified.

Great benefits would result from a census by the general government, taken in periods of five years, instead of ten, as heretofore; and it is to be regretted that there is not in each State a provision for an annual census of the principal farm products, and that in many of those States which have taken some action in that direction, there should be so much neglect and failure in the enumeration required on the part of local officers, many of whom appear to regard the duty as a labor to be performed or neglected at pleasure. The schedules to be filled should be as nearly as possible the same in each State; the duty of the officer should be made imperative, and public opinion should be brought to enforce the requirement. The efficiency of these officers differs much in different States, but the returns of the States most reliably and completely reported fall far short of the figures of the United States census of the same period. If those statistics could be made equally and reasonably complete and accurate in the several States, and the returns should be promptly communicated to this Department, the results might be of exceeding interest and value.

Believing that a more direct and intimate communication between this Department and the people, through the medium of competent representatives, would be conducive of good results, securing co-operation in official labors, comparing results of agricultural processes under different circumstances, noting the progress of improvement at exhibitions or special meetings, and communicating in lectures or conversations the results of official investigations, I have taken occasion, to some extent, thus to employ the services of heads of divisions, in observations having reference to the greater efficiency of their several branches of the Department, and for which they were especially qualified by specific and technical training. I am satisfied that good has resulted both to the Department and to agriculture by this representation.

I take the liberty to suggest that the compensation fixed by law for the services of the head of this Department is entirely inadequate, and would recommend a liberal increase of the salary of the Commissioner of Agriculture. Believing that the time has arrived for providing suitable and appropriate residences for the heads of the different Departments of the government upon portions of the public reservations, I would recommend that a suitable house be erected for the accommodation of the Commissioner of Agriculture, in the vicinity of the

Department buildings. The social position of chief officers of a great nation, if properly maintained, requires outlays greatly disproportionate to the compensation now allowed by law, and with the short periods of official service and frequent changes incident to our system of government, no one can enjoy the comforts of a home without great pecuniary sacrifices.

THE SEED DISTRIBUTION.

The distribution among the people of new and valuable seeds and plants, appears to be one of the principal objects of Congress in the annual appropriations to the Department. This has become a most delicate and difficult duty, for what is new in one country may not be valuable or useful in another; the most valuable of seeds or plants may be, in some sections of our own country, the most common varieties, yet unknown in other sections; and those which would be of the utmost value in one latitude might be worthless in another. Experience has fully shown that a change of seeds and plants from one section to another has greatly improved the yield and quality. These results can only be attained by repeated and constant tests of the adaptation of the several varieties to soil and climate. To introduce or to distribute seed upon any other principle would be useless. The charges occasionally heard of the distribution of worthless and common seed, are caused in many, if not in all cases, by inexperience or neglect, or want of skill in their culture; for the singular anomaly is often presented by unfavorable reports from some, and the most favorable and flattering accounts from others, of the results of the same seeds in the same locality. That seed may not occasionally be mislabelled in the millions of papers put up and annually distributed, would be to claim a marvellous exemption from mistakes. New varieties are obtained whenever satisfactory evidence has been adduced that they have been properly tested; and the people are now enjoying the benefits of many new and valuable products which have been introduced into the country through the agency of this Department. The crops of sorghum alone would more than compensate for all the money expended by the Department for seeds.

The total distribution of seeds for the year amounted to 1,426,637 papers. Of this number 352,000 were distributed through senators and members of the 39th and 40th Congresses; 88,482 through agricultural and horticultural organizations; 164,953 to corps of statistical correspondents, in acknowledgment of valuable gratuitous services; 299,975 to individuals upon letters of members of Congress, or upon personal application, or in answer to letters from individuals; and 521,227 to the southern States, under the special appropriation for that purpose.

PROPAGATING GARDEN.

The distribution of plants from the experimental and propagating gardens from January 1 to May 6, 1867, amounted to 42,123, principally through senators and members of Congress, reaching every State and Territory in the country. The articles have consisted mainly of the smaller varieties of fruits, of which the grape has been in large proportion. The introduction of the best varieties of this valuable fruit, their adaptation to various climates and for special pur-

poses, has been prominently kept in view. The main purpose of the garden, that of testing the respective merits of new varieties, is still kept strictly in view, and all new varieties are procured as early as practicable, and the knowledge gained concerning them embodied in the department reports.

The Department building having been located upon the reservation now used as an experimental farm, an arrangement of the grounds in a manner more in keeping with the surroundings and new improvements becomes not only proper but necessary. As a farm, it has long been evident that the area is altogether too limited for the requirements of the nation; seeds become intermixed, and the products consequently are unreliable. Even with regard to testing the merits of various products, the limited space that can be afforded to each is such as to render an accurate estimate impossible. I would therefore suggest that the reservation be devoted to the purpose of forming an *Arboretum Americanum*, or grand national arboretum, where the unequalled arboreal wealth of this country may be collected and planted in accordance with a strict botanical system, and at the same time exhibit the highest degree of landscape effect. This has long been a desideratum with scientific men here, as well as in foreign countries, and its importance has very frequently been impressed upon the department. A specimen of every tree and shrub capable of existing in the climate would here find its appropriate place, forming a scientific school of instruction to the botanical student, and a valuable resort to the artist, and to all lovers of the beautiful in nature. Plans for this important improvement are now in course of preparation by Mr. Saunders,the horticulturist of this Department. This disposition of the grounds will be hailed with satisfaction, and will be a work of time more than expense, calling for no alteration of present surface more than may be necessary in providing sufficient roads and walks for the inspection of the plants.

THE EXPERIMENTAL FARM.

At the experimental farm, tests of seeds of cereals and garden vegetables, both foreign and domestic, have been successfully continued, though the area cultivated is quite too limited for the best results. Of the 576 varieties included in the experiments, 43 were of winter wheat, 66 of spring wheat, 5 of winter rye, 16 of spring rye, 21 of barley, 20 of oats, 10 of corn, 29 of grass seeds, 3 of sorghum, 9 of sugar beets, 35 of peas, 36 of potatoes, and 27 of melons. Many of these varieties, as was expected, proved undesirable or unsuitable, while others succeeded well, warranting good results in their introduction and cultivation. A statement of results in detail will be found in the report of the superintendent of the farm.

The spring wheat was a failure, almost necessarily, in this climate; it is proposed that tests of this grain be made by individuals in the north and northwest the coming season.

The winter wheat was prostrated by heavy storms late in spring, and therefore attained scarcely three-fourths of the highest yield of the previous year, yet a Tasmanian variety produced at the rate of 37 bushels per acre, weighing 59 pounds. The Tappahannock yielded at the rate of 28 bushels, weighing 65 pounds.

The New Brunswick oats attained the best results—36 bushels, of 39 pounds.

The greatest yield of rye was at the rate of 42 bushels, of 58 pounds.

Of the 36 varieties of potatoes, including the most noted and popular of this country and Europe, the results of last year are substantially repeated. Those standing highest were the Goodrich, Orono, and Samaritan. This season the Samaritan drops to sixth on the list in point of productiveness, and the first three are the Goodrich, Orono, and Colebrook seedling, yielding at the rate of about 300 bushels per acre.

THE CHEMICAL LABORATORY.

In the chemical laboratory of the Department analyses and tests have been constantly made to ascertain the value and utility of various products, fertilizers, minerals, and fibres, the benefits of which the country is reaping. Correspondence has been held and information and advice given on making sugar from sorghum. Attention has been given to a solution of the question as to the extent of territory of the United States in which the sugar beet may be grown for the manufacture of sugar, and in what respects the climatic peculiarities of the country between 35° and 45° north latitude compare with the beet-growing districts of northern Europe. An extended series of examination has been made upon beets grown on the experimental farm of the department, the results of which have not been tabulated and compared. The work will soon be completed, and the results will appear in the report of the chemist. These analyses have been made at different stages of growth, with reference to the effect of fertilizers and to ascertaining the time at which the largest amount and best quality of sugar may be obtained. In view of the great success of the beet-sugar manufacture in France and Germany and the supply of a large portion of Europe with an unexceptionable article of sugar, there is every reason to anticipate an early conquest of all the difficulties which confront the experiment in this country. Already, at Chatsworth, Livingston county, Illinois, the business has been introduced on an extended scale, with every prospect of ultimate success.

STATISTICS.

The work of the division of statistics has been various and laborious. A mass of ascertained facts, of foreign and domestic agriculture, with approximate estimates of current productions of the staples of the farm, will be found in the report of the statistician, condensed and systematized, with careful analyses and explanatory illustrations and comments.

For several years the estimates of production included only the northern States, until people had become familiarized with aggregates representing the production of only a portion of the country. The incorporation of the southern States in a grand summary of agricultural results was doubly difficult in view of the cessation of all regular agricultural order during the war and its shattered and uncertain status on the return of peace. The wonderful agricultural progress of the distant Pacific States has complicated the difficulties of accurate compilation of the statistics of production. Yet with the aid of a large corps of zealous and intelligent reporters in all sections of the country, valuable results have been achieved in this branch of the Department.

In comparison with 1860 the table of numbers and prices of farm stock exhibit a decrease of six per cent. in horses, with a slight increase over the exhibit of the previous year. The heaviest loss is shown in the south; the most rapid recuperation in the west. Prices of horses have retrograded less than values of other stock during the year.

Cows appear to be increasing more rapidly than other horned cattle, as a result, in part, of the success of the associated dairy system.

Sheep, it is claimed, have nearly doubled in numbers since 1860, increasing from 22,000,000 to more than 40,000,000, and their wool from 60,000,000 to 115,000,000 of pounds.

There has been an increase in swine since 1860, principally in the west.

The farm crops of the present season, with some exceptions, have been more abundant than those of last year. The wheat crop, for three years comparatively small, has been generally good, with a large acreage and a moderate yield. Including the southern and Pacific States, the returns, when fully complete, will probably show a total aggregate of more than 200,000,000 bushels.

While corn promised a large yield, with an increased acreage, there were serious local losses, principally in the Ohio valley, which will tend to reduce the estimates.

Cotton is yielding better than last year, and will probably produce an aggregate of more than 2,500,000 bales.

For estimates of the principal products reference is made to the statistical report.

THE DEPARTMENT BUILDING.

The new building for the accommodation of the Department was not contracted for until after the adjournment of the session of the Congress in July last, in consequence of the protracted illness and subsequent death of the Commissioner. The contract was awarded to the lowest bidder, Francis Gibbons, jr., esq., of Baltimore, with whom an agreement providing for the furnishing of materials and erection of a building, upon the plans submitted to Congress, and upon which the appropriation therefor was made, was duly executed on the 2d day of August, 1867, copies of which, with ample security for the performance of the same, are on file in the Comptroller's office, Treasury Department. The erection of the building was promptly commenced and is now ready for the roof, and proceeding with entire satisfaction toward completion. The promptness and energy with which the contractor has thus far progressed with the work warrant the confident belief that it will be completed under the terms of the contract and within the appropriation by the 1st day of March next, or very soon thereafter.

Further appropriations will be necessary for heating, furnishing, fixtures, and grading of grounds and walks around the building, the cost of which has been submitted in the estimates for the expenses of the department for the next fiscal year, and will be duly presented to Congress for consideration.

There has been paid on account of the building, upon estimates of work done and materials furnished, $48,720 89. The remainder of the appropriation is applicable to the payment of further estimates, and the 10 per cent. reservation,

under the contract, upon the completion of the work; and I have no reason to doubt that it will be sufficient for those purposes.

FINANCES.

The declining health of the late Commissioner greatly interfered with the prompt rendering of his quarterly accounts during the last year of his administration, none having been rendered for that period until after I had assumed control of the Department, since which time they have been duly submitted to the proper accounting officer of the government. In the settlement, all moneys drawn by him from the Treasury appear to be accounted for; but during the several years of continual appropriations for nearly the same objects, drafts were made upon certain items of appropriations, and paid out upon others in amounts beyond the appropriations to these objects, and in order to a proper adjustment of his accounts upon the books of the Treasury Department, a deficiency appropriation to the amount of $8,606 42 should be made.

There are also, in addition to the above, various unpaid bills for seeds and other materials, contracted for and used by the Department during his administration, amounting to $35,392 33, to meet which the appropriation for that year was inadequate, and for which a further deficiency appropriation should be made. A schedule of such debts has been submitted to the honorable Secretary of the Treasury for the purpose of being presented to Congress in the usual manner.

The appropriation for the purchase of the Glover museum was promptly applied to that object, and Mr. Glover has duly transferred his collection to the government. This collection continues to be the centre of attraction to all visitors, and its usefulness as an economic museum can scarcely be overestimated. Additions of interesting objects continue to be made, all sections of the country contributing specimens of agricultural products, minerals, and manufactures, or whatever may be considered useful and illustrative of the growth and enterprise of the country.

In reference to the present financial condition of the Department, there has been expended out of the appropriation for the current fiscal year $65,118, leaving a balance of $113,902 to meet the demand for the remainder of the year, which is considered sufficient for the purpose.

Respectfully submitted,

JOHN W. STOKES,
Acting Commissioner of Agriculture.

To His Excellency ANDREW JOHNSON, *President.*

REPORT

OF THE

COMMISSIONER OF AGRICULTURE.

WASHINGTON, D. C., *May* 5, 1868.

SIR: Although my connection with the department of agriculture did not commence until near the close of 1867, when the operations chronicled in the accompanying reports of the several divisions were nearly accomplished, it appears proper in presenting this annual volume,* to refer briefly to certain visible indications of progress in agriculture, and to record my views of the great principles underlying such advancement, and the practical means of the greatest efficiency in securing it. Among these indications are the facts of production for the past year, comparing favorably with those of the preceding years, and giving evidence of the blessing of Heaven upon the industry of the farmer, and the continuance of the ancient promise that "while the earth remaineth, seed time and harvest shall not cease."

The base of agricultural operations, within the last few years, has been materially enlarged by the increased area of land brought under cultivation; and much breadth of tillage has been rendered possible by the practical application of mechanical science in farm machinery, while in limited but increasing degree the soil in cultivation has been made more productive through the scientific use of the various agencies employed in fertilization. By such means in the hands of intelligent, thoughtful, and earnest men—a class yearly becoming more numerous and influential in the practical agriculture of this country—the strength and efficiency of this foundation interest are certainly and surely finding development, and its importance as a competitive branch of human industry is becoming better understood and more fully appreciated.

The census returns of 1860 show that there were engaged in agricultural pursuits a greater number of persons than in those of manufactures and commerce combined; and that the value of farming lands had more than doubled within the preceding ten years. It has become the wonder of the world, that, during the period of a destructive civil war, the demands of consumption and waste should be fully met, and in many respects a steady advancement continued, even amid circumstances of discouragement, and with a manifest deficiency of labor. That this improvement is progressive is shown by careful estimates of the production of 1867, which present an aggregate increase of 10

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* It is my intention hereafter to secure greater promptness in the publication of the report—a reform beyond my power to initiate in the issue of this volume, for which no preparation was made upon my accession to the office, owing to the death of the former Commissioner.

per cent. over the valuation of the yield of 1866, and by the suggestive fact that the cotton production of the United States has again resumed its operation at the head of the cotton-growing countries of the globe.

A comparison of the total productions of the more important staples, as returned by the census of 1850 and of 1860, with the estimates of 1867 for the same products, indicates a fair progression, under the adverse circumstances connected with a civil war which devastated one section and withdrew a heavy percentage of agricultural labor from the other. In the following table, which makes this exhibit, the items of corn and potatoes of 1867 are unusually small, those crops having suffered greater injury than for several years previous:

	1850.	1860.	1867.
Corn.....bushels..	592, 071, 104	838, 792, 740	768, 320, 000
Wheat.....do....	100, 485, 944	173, 104, 924	217, 870, 400
Rye.....do....	14, 188, 813	21, 101, 380	23, 490, 000
Oats.....do....	146, 584, 190	172, 643, 185	275, 098, 000
Barley.....do....	5, 167, 015	15, 825, 898	25, 727, 000
Buckwheat.....do....	8, 956, 912	17, 571, 818	21, 359, 000
Potatoes.....do....	65, 797, 896	111, 148, 867	67, 783, 000
Tobacco.....pounds..	199, 752, 655	434, 209, 461	323, 724, 000
Hay.....tons..	13, 838, 642	19, 083, 896	26, 277, 000
Cotton.....bales..	2, 445, 793	5, 387, 052	2, 300, 000
Wool.....pounds..	52, 516, 959	60, 264, 913	112, 000, 000

THOROUGH DRAINING AND DEEP CULTURE THE BASIS OF IMPROVEMENT IN AGRICULTURE.

The fact is patent to the most superficial observation that the total sum of the vast production of our agriculture is the yield of an average depth of cultivation of the soil not exceeding six inches—comparatively a mere film of the earth's surface. All the inorganic matter needed by plants, and all other elements of their nutrition and full development that come from the earth, must be supplied within this limit, while all the soil below this depth is unemployed and inert. The roots of the grains and grasses do not ordinarily extend much below the depth cultivated; and the average of this in our country is insufficient either for protection against drought, for adequate returns for the labor of cultivation, or for full supplies of farm products for national consumption. We may not be able to calculate the precise amount of increase in production due to an additional inch in depth of cultivation, but experiments have shown that in many soils it bears, relatively, a near proportion to the increase in depth of culture; so that, where the soil is now worked to six inches, an inch greater depth of cultivation would give nearly one-sixth more production. The agricultural produce of 1867, of those articles which would be influenced by depth of culture, has a total value of at least $1,500,000,000. Now, an increase of even one-tenth of this amount by an additional inch of culture would add $150,000,000 to the value of the annual agricultural productions of the country.

An erroneous impression exists relative to the depth to which the roots of the cereals and clovers, as well as many other plants, will descend in an aerated and healthy soil. In ravines that have been filled with surface soil, or wherever the

mould is of suitable texture and condition, carrots and parsnips are often found of a length of three feet or more; clover roots from three to four feet; and instances have been given of still greater length of the roots of wheat and oats. With the prevalent mode of culture, in very compact soils, wheat roots are so near the surface as to be thrown out by the mechanical displacement of freezing and thawing, and, if not utterly destroyed, they struggle fruitlessly to pierce the unbroken subsoil, packed, perhaps, by the tread of cattle for a century, and finally yield to the blasting power of an early drought, blighted, shrivelled, light, worthless for seed, and of little value for bread. The drill, planting the seed firmly in the earth instead of scattering it on the surface, already saves half the winter-killing in the fields where it is used; and deep culture, with proper drainage, would procure exemption from most of the remaining liabilities, and, ordinarily, from all danger of loss from drought. The advantage of additional depth of pulverization, therefore, would often be far greater than the proportionate increase of depth, and the profit of the improvement would be increased in corresponding ratio. In this country the average yield per acre of one of the principal staples, wheat, under our system of shallow cultivation, has been gradually lessened, until at the present time it does not exceed 12 bushels per acre, while England, with her deep tillage and rotation system, has raised her average to 28 bushels. Estimating our wheat area at 18,000,000 of acres, and allowing an increase of 16 bushels per acre under a system of thorough and judicious cultivation, the increased production would amount to 288,000,000 bushels; and wheat is but one of the staples to be benefited by such improvement.

Deep cultivation is a prime necessity of root-culture, which forms the basis of English agriculture, and enables the English farmer to pay annual rents equivalent to the fee-simple value of our farms. The growing of these "green crops" results in a more thorough admixture of the food-producing elements of the soil and its prompt permeation by water and the gases, which are so necessary to plant-growth. France, following in our footsteps, or we in hers, in at least one particular—the want of a proper rotation system—has reduced the average yield of wheat to 15 bushels. The single fact that, while England has two acres in "green crops" for every acre in wheat, France has three acres in wheat for every acre in green crops, and that with us roots are scarcely raised as a farm crop, explains the cause of the great discrepancy in the yield of that valuable cereal in these countries.

In this connection I desire to urge upon the attentive consideration of American farmers a subject of vital importance to the whole country—the cultivation of the sugar-beet and the manufacture of its sugar. I shall refer to this subject in another division of this report.

A feasible plan for effecting this reform in agricultural practice, by which 12 inches might be thoroughly pulverized instead of six, may appear difficult to realize, but it is far less so than many results of invention successfully accomplished, and it is believed that the ingenuity of our countrymen will be fully equal to the undertaking whenever its importance is felt and proper encouragement extended. The free and beneficent institutions under which we live are favorable to the development of inventive genius, as shown in the history of

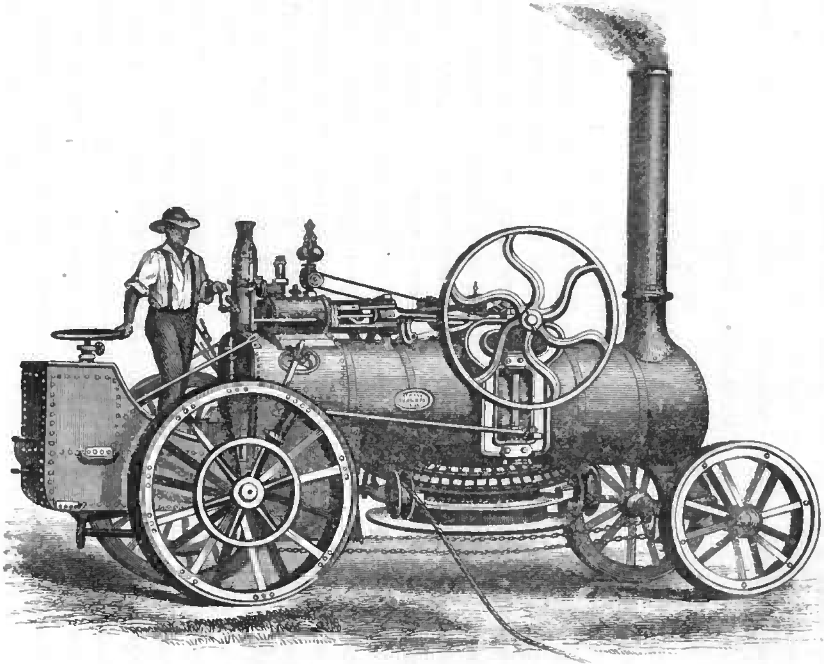
patents; and in no department of invention is there greater progress at the present time than in that of agriculture, no less than 1,750 agricultural patents having been issued in 1867, while but 43 were granted in 1847.

The inventions of the past are but an earnest of the speedy accomplishment of the great want of the present. The invention of the cotton-gin by Whitney gave an impulse to the production of a valuable staple that brought wealth to many and comfort to millions of human beings. The discovery of Prof. Henry, Jackson and of Morse, resulting in the wonder-working telegraph, instantaneously spanning continents, annihilating space and time, has lengthened life, measuring it by what it can accomplish. The persistent and unwearied researches of Goodyear, in bringing the manufacture of india-rubber to its present state of perfection and adapting it to the supply of the wants of so large a number of the human family, may be largely attributed to this physical and intellectual freedom with which our country is blessed. In the line of agricultural invention, by which half of the farmer's labor is superseded, the reapers and mowers of Hussey and McCormick, strengthened by improvements resulting from the ingenuity of a multitude of others—the horse-rake, hay-fork, and a countless variety of appliances for saving labor—all attest the capacity of American invention, and point to the ultimate certainty of a better and cheaper means of disintegrating and pulverizing the soil and of cultivating the growing crops. In the benefits of this activity of agricultural invention the plough has not fully participated. In breaking and working the soil in preparation for a crop, improvement has been relatively slow. Essentially the same plough, the same power, and the same depth of cultivation have been continued through the period of these important inventions. It cannot be supposed that the means of economically doubling the depth of present culture are more difficult of discovery than the labors of inventors already accomplished. A stimulus to efforts in this direction has been needed. The importance of the subject has not been appreciated. The want has not been felt. Let the idea be fully realized that three thousand millions of dollars lie buried within six inches of the present depth of cultivation of the soil of this country, and some Whitney, Goodyear, Hussey, or McCormick will devise a plan of rendering it available.

STEAM-PLOUGHING.

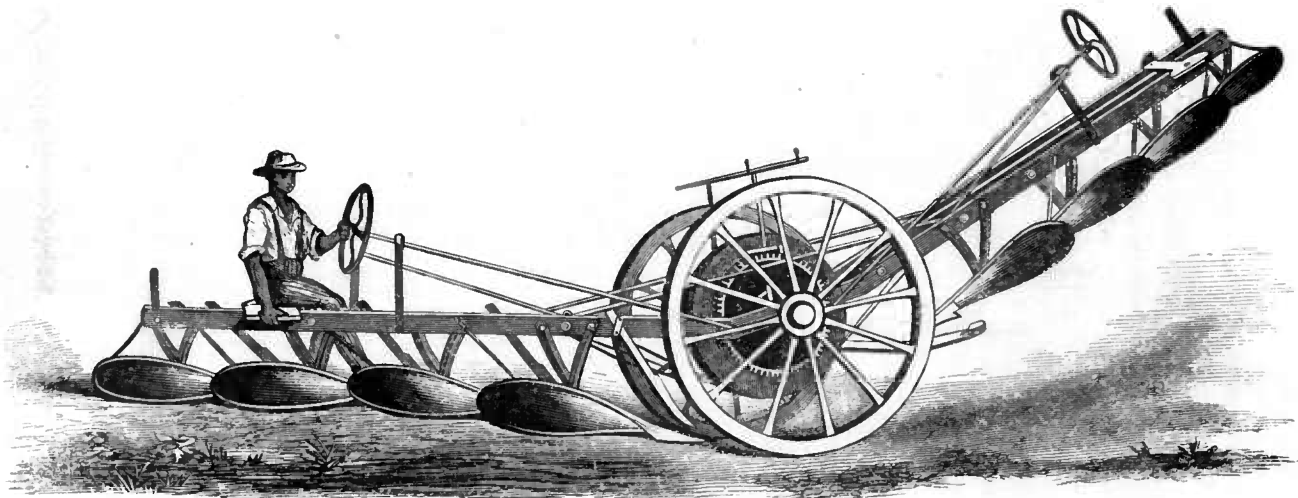
As great a change in the mode of cultivation may be realized through the agency of steam as has been effected in travel, or in carrying the products of culture to market. It is stated that there are already 3,000 steam-ploughs at work in England, some of them with stationary engines capable of driving from three to six ploughs each, and doing better and deeper work than formerly, with a reduction of one-third of the horses and one-half of the laborers. In ploughing, the desideratum sought is perfect cultivation, which involves such preparation of the soil as will secure the rapid growth, complete development, and full maturity of the various crops at the least cost in proportion to the results attained. The failure in thorough pulverization most frequently results from want of adequate power in hard or heavy soils. Insufficient power with light ploughs breaks imperfectly a shallow depth, while the mighty power of steam, harnessed to ponderous and strong implements suited to the various purposes of breaking, pulver-

PLATE II



DOUBLE CYLINDER ENGINE.

PLATE III.



FOWLER'S BALANCE STEAM PLOUGH.

izing, or intermixing soils, accomplishes all the results of a superior cultivation in less time and at less expense than by any other method. Sufficient importance is not always attached to thorough disintegration and mechanical admixture of the various ingredients of soils. However rich these may be in plant-food, vegetation will starve if it is not found in soluble form, or not in contact with the delicate root-fibres, which act as mouths of the plant; and its solubility will depend upon the action of the atmosphere, heat, and consequent chemical changes, facilitated by loosening and mixing the earth, which supplies, in good part, the elements of growth. "In this steam-culture is allied to spade-husbandry, producing essentially the same results, aerating to a great depth, giving unobstructed course to the most delicate root-growth, aiding necessary decomposition, promoting recomposition, and increasing soluble plant-food, thus protecting against the influence of drought and enlarging wonderfully the capacity of the soil for production. It is declared by an agricultural writer that a team of four horses, ploughing a furrow 10 inches wide, will leave 200,000 foot-prints on an acre. This packing of the subsoil by the weight of horses or cattle year after year is a source of mischief that few have properly estimated, but which may be obviated by the use of steam in cultivation."

The Viceroy of Egypt is said to have in operation 200 sets of steam-ploughing machinery of the largest class, by means of which the recent remarkable increase in Egyptian cotton production has been attained and the quality of the fibre improved. There are at this time two sets of English steam-ploughing machinery in the United States, one in Louisiana, which is daily in successful use, and the other in Illinois, of which I have no definite report. By the plough now working in Louisiana eight acres of ground per day are broken up, being ploughed 14 inches deep through a soil of unsurpassed toughness; after which the steam cultivator is used, which occupies a place between a large harrow and a subsoiler, piercing the ground to a depth of 16 to 18 inches, and operating as a great pulverizer. This ploughing is accomplished at a cost of $2 25 per acre; the cultivator preparing 12 acres per day, at a cost of about $1 50 per acre. In England it is held, upon competent authority, that, including interest on the investment, depreciation, and repairs, the average yearly cost of maintaining a set of steam-cultivating machinery, breaking and cultivating 2,000 acres 10 or 12 inches deep, is not more than £300, or three shillings (75 cents) per acre.

In the report of the commissioners appointed by the Royal Agricultural Society of England the following conclusions are given:

The commission selected 140 farms, embracing 66,000 acres, probably not one-third of the *steam-tilled* area of the kingdom.

In the use of the steam plough in agriculture, its successful results depend much upon the energy, vigilance, and skill of the person who employs it. Here, as elsewhere, success is obtained only when business habits are combined with scientific principles.

In comparing horse-labor with steam, in the case of *deep working*, there is no doubt about the advantages of the latter. The Marquis of Tweedsdale's great plough, worked with 12 horses, got over about half an acre a day. The seven-horse-power engine did three acres a day to the same depth.

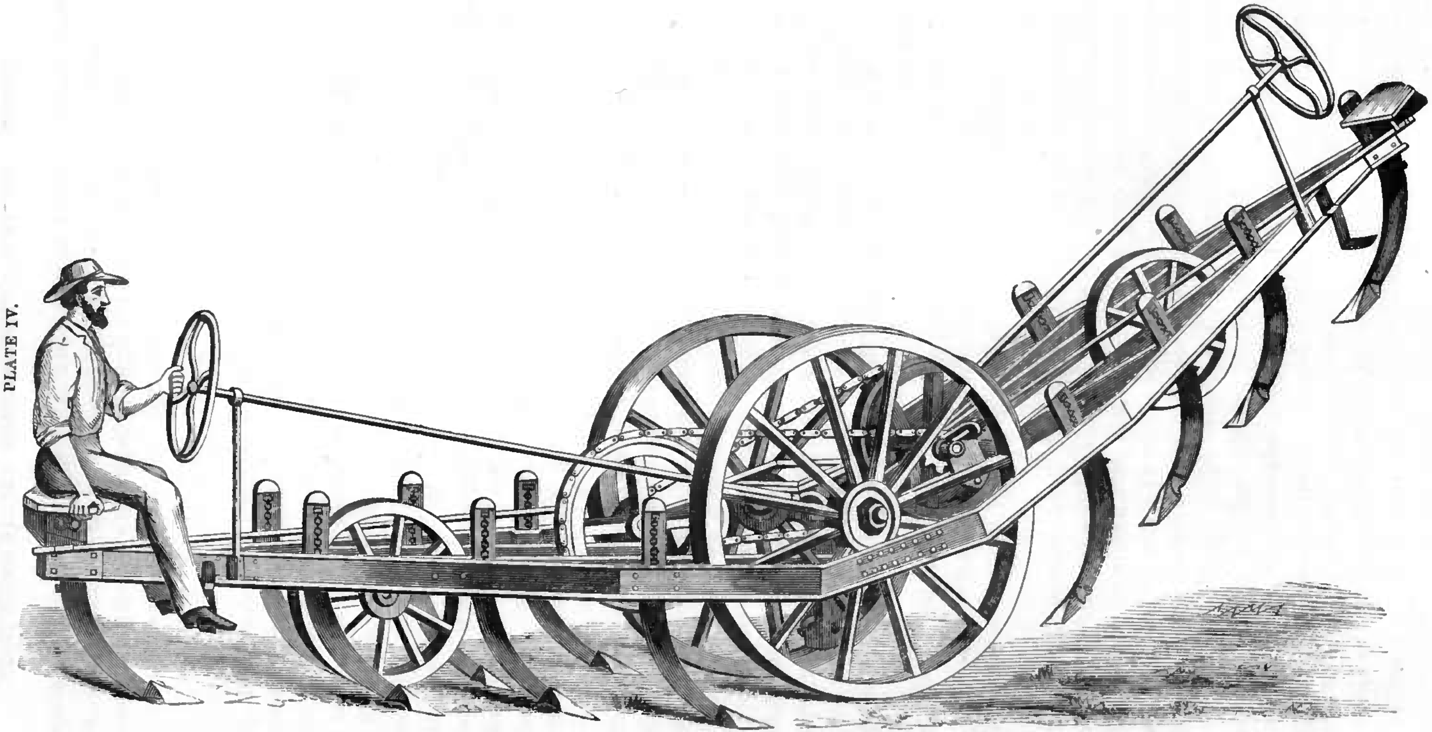
Not only has the yield in steam-worked land been found to be increased four bushels per acre, but its market value has increased 3*d*. per bushel. The staple is deeper and better

mixed with subsoil, and produces a straw stout and standing erect. The root crops are also better. Work is done not only with greater despatch, but with greater certainty. It was once difficult to say when four teams would finish a 20-acre field, but with steam the time of finishing can be predicted to within an hour. Upon medium and heavy soils the benefits obtained by steam-ploughing are undeniable. A culture deeper than it is possible for horses to effect, works a highly beneficial influence in the texture of the soil, imparts additional efficiency to drainage, augments the value of the manure applied, and brings into activity certain latent properties of the soil which must increase its fertility. In nearly all the cases reported, it will be seen that the expenses of cultivation have been very much reduced, and that a large amount of produce is said to have been realized. Another perceptible result, to which attention was frequently drawn, was the quickened pace. Not only are the operations themselves better done, less expensively done, but all kindred and collateral movements have imparted to them a speed and "whir" characteristic of steam. Men acquire the habit of doing the day's work within the day, and not of leaving it for the morrow.

Upon the great question between a stationary or a headland-moving engine, or between one engine and two, while advantage is derived from employing cheap, light tackle for a few fundamental operations, greater benefit is derived from a more powerful apparatus that can drive all the heavy tillage-work on the farm. Until the useless and encumbering fences are removed, the double-engine system is the best for farms of determinate enclosures. While on dry land the benefits of steam culture are great enough to warrant the purchase of a single-engine apparatus on a comparatively small farm, small occupants must in general depend upon "partnership" or the "hiring system." Partnership has been found to work well in several cases, and the "hiring system," under both individual and partnership proprietors, has also worked well. No insuperable difficulty exists about drilling agricultural laborers to manage the steam machinery. Many other points might be added, such as the cost per acre being demonstrated to be of less consequence than the saving of time; that clay land can be flat, and yet drain well; that the annual cost of steam-tillage on a farm is generally less than that of the horses it has displaced; and that an increase of produce, in some instances as much as eight bushels per acre, has resulted from steam cultivation.

The foregoing conclusions from the report of the commissioners are sufficient to invite greater attention to this interesting subject than it has hitherto claimed in this country. Among the important performances of this powerful machinery for steam culture is that of breaking up or crushing the softer rock or stones in the cultivated lands to the depth of 12 or 15 inches and incorporating them with the soil. It is a great injury to a close, stiff soil to remove all the stones from it. Besides the loss to the soil from the gradual disintegration of the stones or rocks through the action of frost or other agencies, their mechanical influence upon the soil—especially when reduced to small size and mixed with it to the depth of 12 to 15 inches—in keeping it open, facilitating drainage, and increasing its power of absorbing air, moisture, and the gasses which afford nutrition for vegetation, is, to a high degree, favorable. Many years ago an able article was published in an English periodical, stating that a turnpike road, paved with stones gathered from contiguous grounds, was made through a fertile district of that country, and in a few years the lands from which the stones had been removed on each side of the road became greatly deteriorated, while those lands subject to the same system of tillage, at a greater distance from the road, and on which the stones were permitted to remain, maintained their fertility. No stones should be removed from the soil, especially a tight one, except such as are decidedly in the way of cultivation and cannot be conveniently broken up and their parts incorporated with the soil. In preparing land for mowing,

PLATE IV.



FOWLER'S BALANCE CULTIVATOR.

all small sized stones should be sunk into the soil, rather than picked up. Such preparation of the entire cultivated soil must be a work of time, but the point now aimed at is to direct intelligent attention to the subject as one of no small importance to the agricultural interest.

SILK.

It should be the aim of a wise, industrial economy to encourage the gradual extension of the various interests of agriculture until everything consumed in the country, to the growth of which our various soils and climate are adapted, shall be produced on our own lands. The large accession to the number of free laborers in our country, and the rapidly-increasing intelligence and skill of our laboring population, together with the unprecedented immigration of the embodiment of hardy industry from other lands, are highly calculated, if properly regarded and directed, to give an accumulated efficiency to agricultural pursuits, and to render the present an auspicious period not only for the introduction of machinery into departments of business into which it could not formerly be extended, but also for employing unskilled labor in an increased variety of the pursuits of husbandry.

The primary wants of man are simply food and clothing, and on the first clearing and settlement of a country the pioneer is satisfied with coarse materials for both these purposes. His main object is simply the support of himself and family. Roots, fruits, cereals, milk, meat, and wool are the sum of his wants. The cow and sheep deservedly occupy a high place in his estimation. Wise economy and industry lead to competency, intelligence, and refinement, and those soon demand the supply of new wants. Among those of the products of agriculture are silk, sugar, and wine, to the profitable production of which portions of our extended country, with its great variety of climate, are remarkably well adapted.

Attention has been called to the possibilities of American silk production by Elliot C. Cowdin, one of the commissioners of the Paris Exposition, by the efforts of Mr. Prevost and others in California, and by various enterprises elsewhere.

The culture of the mulberry tree in Virginia was encouraged by James I, and the coronation robe of Charles II was spun from Virginia silk. Silk husbandry was introduced at an early day into Louisiana, and a state robe was made from Georgia silk, in 1735, for Queen Caroline. In 1749 the export of cocoons was 1,000 pounds, and in 1766 it had reached 20,000 pounds. Afterwards a decline resulted from the withdrawal of the government bounty.

Pennsylvania and New Jersey about this time became interested in the business, and Dr. Franklin, in 1770, sent seeds, mulberry cuttings, and silk-worms' eggs for distribution. A silk manufactory was established in Philadelphia in 1771, which received cocoons for several years. A court dress of silk, from cocoons of Lancaster county, was acknowledged with a present of lands. New Jersey planted mulberry groves extensively, and New York made similar experiments. Connecticut and Massachusetts led this interest in the eastern States. The revolutionary war put an end to all these enterprises.

In the revival of industry at the commencement of this century, renewed efforts to establish the silk business are observed. In 1819 five tons of raw material were produced in Mansfield, Connecticut. In 1842 the New York State prison, at Auburn, produced $13,000 worth of sewing silk. In 1840 the total domestic product of silk was 60,000 pounds, valued at $250,000; in 1844, 400,000 pounds, worth $1,500,000; and in 1850 only 14,673 pounds. In 1860 Connecticut, New Jersey, Massachusetts, Pennsylvania, and New York produced $5,000,000 worth of sewing silk, some silk stuffs, ladies' trimmings, and other goods. Philadelphia and New York manufacture about $2,300,000 of these articles annually. The business, in all its branches, has greatly increased since 1860. Some of the most important manufactories are located in Paterson, New Jersey, and Hartford, Manchester, and Mansfield, Connecticut. The most encouraging field for this enterprise in this country appears to be presented in California; the cocoons from that State were among the finest on exhibition at the French Exposition. Great interest has already been taken in the silk enterprise, and a rapid extension of the business is in progress. Experiments in the culture of the tree and the feeding of the worms have been so favorable as to warrant the belief in results far in advance of anything in the history of silk production. In the dry, pure, and equable climate of this State the leaf of the mulberry secures the most abundant nourishment and the most perfect texture and fibre. During the season for feeding the worms, from June to October, there are no rains to wet the food, no sudden changes in the atmosphere to check the growth of the worms, and no thunder-storms to benumb or kill them; while in all other countries the loss from these causes is scarcely ever less than 25 per cent., and frequently more than 33; in California it may be said to be inappreciable.

These facts warrant the belief that the present condition of silk cultivation in this country is well deserving the attention of the political economist and the legislator.

SUGAR.

The production of sugar from the sugar-cane has long been an important branch of agriculture in some of the southern States, but the manufacture of the same article from the sugar beet, although holding a high inherent competitive position, has not been developed, as a business, to the same degree.

The present depressed condition of the cane-sugar interest at the south seems to render imperative some action on the part of the government for its resuscitation; and the importance of encouraging its production from all other available sources commends itself most particularly to the agriculturists of the country. Our present annual consumption amounts to $60,000,000, of which we produce only a moiety. The domestic production in 1859, as returned by the census, was, of cane sugar, 230,982,000 pounds; of maple, 40,120,205 pounds. The cane-sugar interest, though advancing slowly from its depressed condition during the war, yielded in 1867 not exceeding 40,000,000 pounds. Of beet sugar there was produced, during the last season, by the establishment at Chatsworth, Illinois, 1,000,000 pounds. Other companies have been formed in Illinois, in California, and in Wisconsin.

When we consider the enormous outlays upon a cane-sugar plantation, for the necessary buildings and machinery for its manufacture, reaching, in some cases, $100,000, and that this is only required to be in operation two months of the twelve, it becomes an important inquiry how the manufacture of sugar from the two substances may be combined to advantage. Chemical analysis of sugar beet, at different periods of its growth, by Professor Antisell, the chemist of the department, shows that it is most productive of saccharine matter, in this latitude, in the months of July and August, or during the prevalence of alternate showers and warm sunshine. In Louisiana the beet seed may be sown in January; the beet would attain its greatest perfection in April and May, a time most propitious for that climate. The machinery, with slight additions for rasping and preparing the root, may then be put into operation and continued upon the beet until the cane is ready for use, and again, when the cane is exhausted, placed upon the dried beet for the remainder of the year.

As an indication of the importance of the manufacture of beet-root sugar and the present status of the business in this country, I may be pardoned for reproducing a portion of my letter in response to a call from the Hon. Mr. Cullom, member of Congress, of Illinois, upon this subject:

As investigations of the subject are now in progress in this office, including original analyses of the beet at different periods of its growth, a complete history of the enterprise in this country, and a synopsis of European experience and its results, I will at this time only give a brief view of the importance and extent of the beet-sugar business in its present status.

Without government encouragement at the outset it might not now be numbered among the industries which bless the world. When the first Bonaparte fostered the art of extracting sugar from this garden vegetable as a practical matter, the possibility of obtaining a good article had long previously been demonstrated by chemists; it only remained to be shown that the manufacture could be conducted with profit on a large scale. His object was to exclude from his empire the sugar of British colonies, the price of which was then four or five francs per pound. A prize of 1,000,000 francs was offered by the French government for the most successful method of obtaining a supply of indigenous sugar. It was soon evident that such a supply must be furnished from the beet root.

In Poland also, in 1812, government loans and exemption from conscription, in aid of the enterprise, were freely offered. In fact, the principal governments of continental Europe vied with each other in perfecting and extending the new business.

A manufactory of beet sugar was in successful operation in Silesia as early as 1805, and in France repeated experiments were undertaken a few years later. Up to 1818 no very marked or rapid progress was made, though the business was constantly extended.

In 1839 the manufacture, already established upon a solid footing, embraced the operations of 268 factories in France, Germany, Sweden, and Russia. In 1848 France alone had 294, Prussia 346, and Russia 425. The present number of factories in France (according to De Neumann) is 449; many of them are far more extensive than those of former days, and 14 of the number have been established during the past year. At the 1st of January, 1868, 3,173 refineries of beet-root sugar were reported as in operation in Europe.

The total product in 1828 is stated to have been 7,000 tons; in 1851, 180,000 tons; and in 1867 the enormous quantity of 663,000 tons, or 1,485,120,000 pounds, worth $100,000,000, or about seven cents per pound.

Sixteen years ago France was able to manufacture half of her total consumption of sugar, or 60,000 tons; and Belgium, consuming 14,000 tons, imported in 1851 but 4,000 tons. Germany, at the same date, produced 43,000 tons, Austria 15,000, and Russia 35,000 tons, the latter country also importing at that time 50,000 tons of sugar in addition to the home pro-

duct. The total manufacture of Europe, as stated above, has been almost quadrupled since that date, and cane sugar, in several of those states, is now scarcely known.

The amount manufactured in France during the three months ending November 30, 1867, was 120,553 tons—18,613 more than was made in the same period of the previous year.

During the past year 15,000 tons of raw beet sugar have been imported into London, yielding customs revenue to the amount of £159,883, or more than three-quarters of a million of dollars. An English sugar refiner, who uses 300 tons of raw beet sugar per week, now offers 18 shillings ($4 50) per ton for 6,000 tons of English sugar beet.

The product of beets per acre is from 14 to 15 tons in France and Belgium. Enormous crops have occasionally been reported. The English Gardener's Chronicle contains the statement of M. de Gasparin, of 27 tons seven hundred-weight grown upon 39 perches 16 square yards, or nearly 110 tons per acre. He sowed the seed under glass, transplanted plants in April, hoed repeatedly, and irrigated every two weeks.

A ton of beets yields about 100 pounds of raw sugar. At first the proportion of sugar obtained was but three per cent.; it was increased to six and even to seven and a half per cent.

The beet cake for feeding purposes, the molasses, alcohol, and other products obtained, greatly increase the aggregate which makes the total value of this branch of industry. Beet-sugar districts become so enriched that far greater amounts of the cereals and other products of agriculture are obtained than before beet factories were known.

The growing of the beet requires rotation, as well as thorough culture and careful weeding. It would therefore be a boon of untold value to our wheat-producing districts of the West, which are decreasing year by year in returns for labor expended, from these causes and the additional neglect of stock-growing.

A promising beginning in beet-sugar making has been commenced in Chatsworth, Illinois, and fine samples of its sugar may be seen in the museum of this department. A history of this enterprise will hereafter be given. It has, of course, met with difficulties, surrounded by new circumstances, with high rates of labor and interest on money—which will all, I have no doubt, be eventually overcome. Many individuals and companies stand ready to engage in the business when its success upon our soil is fully demonstrated. Then in the West, as in Europe, flourishing towns and villages will spring up upon prairies that are now without population or improvements, and an impetus will be given to all other business by the successful manufacture of a raw product taken from adjacent fields, involving the supply of an imperative want of every class of our people.

Another feature of the business is worthy of attention. The production of the sugar beet by farmers, for sale in a dried state to manufacturers of sugar, may be made to yield an immense revenue to rural industry. The beets are cut in small pieces, after washing, and dried by artificial heat, by which process from 80 to 84 per cent. of their weight is expelled, leaving a residue containing 55 per cent. or more of sugar, which is extracted by infusion, often after months of delay and transportation to distant factories. A specimen of this dried beet can be seen in this department, made by Thomas Gennert, of Chatsworth, Illinois, who claims about 80 per cent. of sugar in it. As an illustration of the extent of such a business, a record may be cited of an establishment for obtaining sugar by infusion of dried beet, at Waghausel, near Carlsruhe, in the duchy of Baden, in which 3,000 people were employed, a capital of 80,000,000 francs (or $16,000,000) used, and 12 acres of land covered with buildings.

The large and increasing quantities of sugar and molasses required for consumption in this country, and the amount of money paid for foreign labor in its production, can be appreciated by a glance at the following statement of imports for five years, which is in addition to a small domestic product of cane, maple,

and other sugars, and large quantities of sorghum sirups; a small amount, also, by indirect trade, is not included, on account of incompleteness in the official statements of imports:

Year.	Sugar.		Sirup and molasses.	
	Pounds.	Dollars.	Gallons.	Dollars.
1862	557,137,529	20,357,090	25,157,280	3,427,813
1863	518,594,861	19,082,017	31,206,986	4,732,378
1864	632,230,247	29,660,076	33,571,230	7,256,064
1865	608,855,989	25,248,299	43,309,003	7,471,467
1866	977,885,449	39,595,677	47,768,348	7,227,351

Here is a total of $133,943,159, gold value, paid for foreign sugar in five years, and $30,115,073 for the molasses, an average of about $33,000,000 per year, and more than $50,000,000 in currency, the most of which, if not all, should be retained at home. In view of the great success of the business in Europe, the American people owe to the world's estimate of American enterprise a determined and persistent effort for its establishment here. I see no reason to despair of its complete accomplishment, and shall therefore deem it a duty to encourage and forward this result so far as official means and opportunities may permit, and I would respectfully call the attention of Congress to the importance of practical investigations among the factories of Europe, tending to exhibit especially the comparative economy of process of manufacture, and to show how the peculiar difficulties attending the experiment here may be overcome.

The report of Professor Antisell, chemist of this department, will command special attention for its analytical research. It brings out several important facts relative to the sugar beet. It should be borne in mind that the beets upon which he experimented give no adequate test as to the percentage of sugar in the beet raised in this country, as they were grown on land highly manured and otherwise in unsuitable condition for a fair experiment; but this percentage, as exhibited at different periods of its growth, and under different influences, is interesting and deserves special attention.

NEW FIBRES.

There are other subjects which begin to attract the attention of the enlightened agriculturist, and which may sooner or later take their position among the productive interests of the country. Prominent among them may be named the Angora goat and the Ramie plant, the former producing a fleece of unsurpassed fineness, from which for centuries Asiatic nations have manufactured valuable fabrics, commanding fabulous prices, in some cases nearly their weight in gold, the latter a fibre, coming in between the silk and linen, partaking to some extent of the characteristic of both. Of this fibre the Chinese have made from time immemorial their unique and cool summer dresses, equalling in many instances the finest linen productions. Both have been thoroughly acclimated in this coun-

try, the goat finding a genial climate in middle and western Virginia and East Tennessee, and the Ramie plant its proper conditions for successful growth all over the south. These fibres await the capital and the skilled workman to develop their manufacture. It is hoped they may become valuable adjuncts to our fibre-producing resources. The department has taken great pains to elicit information upon these important interests which will be found among the other valuable matter comprised in the volume now presented to the public.

GRAPE CULTURE AND WINE.

Several very valuable essays upon these subjects will be found in this volume, including the Report of the American Commissioner at the Paris Exposition, which has been reproduced from our monthly report of March; also an article upon the wine manufacture in this country by Husman, of Missouri. The consideration which these topics have heretofore received in reports of this Department renders it unnecessary to say more than to urge the vigilant attention of the whole nation to the advancement of these leading productive interests of agriculture.

SOUTHERN AGRICULTURE.

It is gratifying to note, amid the discouragements attending the loss of property, the destruction of the prevalent labor-system and political disturbances of the day, a marked change in the aspects of southern agriculture arising from more correct views of the dignity of labor, an acknowledgment of the sources of true independence, a disposition to practice a more thorough culture, decided progress in the use of fertilizers, a tendency to a greater production of breadstuffs and meats for home consumption, and a general diversification of rural industry. These evidences are neither isolated nor few; they begin to pervade all classes—the once opulent proprietor, the poorer white population, and the ignorant freedman. There are yet discouragements to encounter, prejudices to dissipate, and ignorance of the poorer classes to enlighten, before a regenerated agriculture shall bless the land and enrich the people. This region is rich in fertilizing material, obtainable at a trifling cost, and especially adapted to the wants of the soil; its resources in marls are inexhaustible. These deposits are found in the tide-water section, from Delaware to Florida, lying near the surface, sometimes forming the subsoil, and susceptible of easy admixture with the surface earth. The extended system of bays and estuaries, for which the Atlantic coast is remarkable, affords cheap water carriage by which this fertilizer may be brought at a nominal cost to millions of acres of valuable farming lands. Analysis of these marls, by the chemist of this department, has confirmed the estimate of their value which farmers have repeatedly attested in their practical experience. A recent discovery of a deposit of mineral phosphate of immense extent in South Carolina promises important aid in the regeneration of southern agriculture. Other local sources of fertilization exist, as fish, seaweed, muck, pine straw, cotton seed, refuse, &c., which will contribute largely to the same beneficent result.

The cotton interest, of late so much depressed, is again attaining large propor-

tions. Great Britain, the largest consumer of cotton in the world, imported in 1860 3,600,000 bales, of which 2,580,000 were obtained in the United States, more than three-fourths of the number of bales and more than four-fifths of the total weight. In 1862, by reason of the civil war, the receipts from the United States were but 72,000 bales, or one-twentieth of the total number imported, while Egypt had made an increase of nearly one-fourth, Bengal of one-third, and India of almost one hundred per cent. in two years. Since 1862 India has nearly doubled her shipments of that date; Egypt made nearly a three-fold increase from 1862 to 1865, and then commenced a rapid retrograde; and Brazil has shown a continued increase and an aggregate four times as large as the figures for 1860. The increase from minimum of the United States receipts in 1862 was regular and rapid during the years of the war, and, since 1865, has been wonderfully accelerated, until, in 1867, this country takes its former place at the head of the list in the cotton supplies of Great Britain, furnishing 528,162,096 pounds, while the British East Indies yield 498,317,008 pounds. Although the shipments from this country do not equal those immediately preceding the war, it is worthy of remark that those sent to Great Britain are equivalent to nearly five-sixths of the total British imports in 1850. The complaints of planters during the past three years that the days of cotton production were over, were the natural effect of discouragement and despondency; yet how baseless and unreliable they proved as a prediction may be seen by comparing with the figures for 1860, those for 1850 on one side, and those for 1867 on the other, by which it appears that the recuperation from 1865 is far more rapid than the increase from 1850.

	1850.	1860.	1867.
United States..................pounds..	493,153,112	1,115,890,608	528,162,096
Other countries..................do....	170,423,749	275,048,144	634,374,816
Total	663,576,861	1,390,938,752	1,162,536,912

As the shipments to Great Britain were 135,832,480 pounds in 1865, and 528,162,096 pounds in 1867, the increase has been 140 per centum per annum against 12 per centum per annum from 1850 to 1860. The trade for the first quarter of 1868 has been still more encouraging, this country having shipped more than two-thirds of the total British receipts, against one-half for the same period of 1866 and 1867, increasing in one year from 999,403 hundred-weights to 1,681,830 hundred-weights.

DEPARTMENT OPERATIONS.

The operations of the several divisions of the department for the current year are detailed in the several reports of division officers, which reports will indicate, in some degree, the character and extent of the researches and labors of those branches of this office. The papers accompanying will be found to contain the results of important statistical and other investigations and collec-

tions undertaken by the department upon topics of present manifest value and importance. It is my desire to make this annual publication not only essentially valuable, but also more truly a report of official operations.

I have made essential changes in the mode and matter of the seed distribution, and have abolished the experimental farm, from necessity, the grounds having been taken for the site of the department buildings, as well as from choice, the area being quite too small for any practical purpose in testing farm seeds.

The seed distribution of the year, to November, 1867, amounted to 1,426,637 papers. Of this number 352,000 were distributed through members of Congress; 88,482 through agricultural and horticultural organizations; 164,953 to statistical correspondents; 299,975 to individuals; and 521, 227 to the southern States, under special appropriation.

The number of plants distributed from the experimental and propagating gardens, from January 1st to May 6th, 1867, was 42,123.

The building in process of erection for the use of the department was placed under contract on August 2d, 1867, in accordance with the provisions of law authorizing appropriation for the purpose. The contract was awarded to Francis Gibbons, junior, of Baltimore. Up to the date of my accession to the office of Commissioner, the payments under that appropriation were $48,720 89. The building is now nearly finished, and will be ready for occupancy by the 1st of September, 1868.

FINANCES.

The following condensed statement represents the financial condition of the department, December 4th, 1867, the date of my entry upon the duties of Commissioner, with the amount disbursed from January 4th to the 31st inclusive, and the balance unexpended of the appropriation for the fiscal year ending June 30th, 1868:

Compensation of Commissioner and clerks:	
Amount unexpended December 4, 1867	$25, 142 27
Amount disbursed from 4th to 31st December, 1867, (less United States revenue tax)	3, 090 54
Amount unexpended January 1, 1868	22, 051 73
Contingencies, stationery, freight, fuel, lights, &c.:	
Amount unexpended December 4, 1867	$9, 940 59
Amount disbursed from 4th to 31st December, 1867	106 23
Amount unexpended January 1, 1868	9, 834 36
Collecting agricultural statistics:	
Amount unexpended December 4, 1867	$7, 549 14
Amount disbursed from 4th to 31st December, 1867, (less United States revenue tax)	623 37
Amount unexpended January 1, 1868	6, 925 77

Purchase and distribution of seeds:

Amount unexpended December 4, 1867	38,878 96
Amount disbursed from 4th to 31st December, 1867	4,373 73
Amount unexpended January 1, 1868	34,505 23

Superintendent and clerks in seed-room:

Amount unexpended December 4, 1867	$4,361 42
Amount disbursed from 4th to 31st December, 1867, (less United States revenue tax)	438 05
Amount unexpended January 1, 1868	3,923 37

Propagating and distributing plants, cuttings, &c.:

Amount unexpended December 4, 1867	$7,729 25
Amount disbursed from 4th to 31st December, 1867, (less United States revenue tax)	1,167 72
Amount unexpended January 1, 1868	6,561 53

Experimental farm, Reservation No. 2:

Amount unexpended December 4, 1867	$3,730 46
Amount disbursed from 4th to 31st December, 1867, (less United States revenue tax)	408 24
Amount unexpended January 1, 1868	3,322,22

Erection of a Department of Agriculture:

Amount unexpended December 4, 1867	$51,092 61
Amount disbursed from 4th to 31st December, 1867	7,725 81
Amount unexpended January 1, 1868	43,366 80

Total amount unexpended December 4, 1867	$148,424 70
Total amount disbursed from 4th to 31st December, 1867, (less United States revenue tax)	17,933 69
Total amount unexpended January 1, 1868	130,491 01

In conclusion, I would call upon men of thought and action, who are so zealous and active in promoting agricultural progress, to continue their labors, individual and in co-operation with organized societies and with this Department, until the country shall teem with abundance and the tillers of the soil shall attain a high condition of independence and intelligence.

HORACE CAPRON,
Commissioner of Agriculture.

His Excellency ANDREW JOHNSON, *President.*

CONDITION OF THE DEPARTMENT.

The following special report, in response to a resolution of the House of Representatives, presents the views of the Commissioner upon the internal economy of the Department:

DEPARTMENT OF AGRICULTURE,
Washington, D. C., January 13, 1868.

SIR: In conformity with the resolution adopted by the House of Representatives on the 9th ultimo, viz: "*Resolved,* That the Commissioner of Agriculture be instructed to report to this house the condition of the Department of Agriculture, and what legislation is necessary to enable him to so reorganize the department as to place it upon a footing commensurate with the vast interests committed to its charge," the Commissioner respectfully submits his report thereupon.

The great importance of the interests involved in this department causes me to approach my reply to the resolution with feelings of weighty responsibility. With the agricultural interests all others of our country are immediately connected. In its prosperity and its embarrassments the different departments of business more or less share.

Besides the fact (which, though so patent to observation, is liable to be overlooked, and requires to be frequently pressed upon our notice) that not only the whole of mankind, but all animated existence, are entirely dependent upon the soil for their life and support, and mostly upon the growth of the latest season, many of the fabrics of industry, as cotton, wool, silk, leather, sugar, &c., have the origin of their supply in the soil. Hence, the more productive a soil can be made, the more abundant is food and the greater the supply of those materials upon which so large an amount of human industry is employed, resulting in untold additions to the comforts and conveniences of the human family. The great object of this department, in accordance with the true principles of political economy, is, therefore, to arrive at a knowledge of practical means and purposes by which the greatest amount of the most valuable products can be continuously produced with the least amount of labor and expense, and thus adding in the greatest degree to the wealth of the country. To this end my humble efforts shall be directed. The immense capital invested in the varied agricultural pursuits, and the great proportion of the population engaged in that interesting employment, render necessary the closest attention that can be given, to add to the incomes of that capital and to the efficiency of the labor of that population.

By the census of 1860, the whole number of persons in the United States engaged at that time in manufactures and kindred branches was 2,017,653, and of those engaged in commerce and connected pursuits, 757,773; while the number engaged in agricultural operations was 3,381,583, exceeding the combined number engaged in both the other pursuits by over 600,000.

The cash value of the farms in 1850, as given in the census, was $3,271,575,426, and in 1860, $6,650,872,507, the value being more than doubled in the intervening decade. As remarked of the farmers by Mr. Enfield, in his valuable treatise on Indian corn, "their numbers are rapidly increasing, and their achievements do not flag. The annual fruits of their industry have reached a prominence and magnitude everywhere seen and felt, and everywhere acknowledged to be without a parallel. American husbandry has made its mark in the

world, not only by the intrinsic value, but equally by the quantities of its products. The unexampled amounts of grain and provisions which it has annually poured into the channels of commerce have justly challenged the attention and the amazement of mankind."

Such is a slight view of the interests to be guarded and promoted by the department which has been intrusted to my charge.

This department has been comparatively recently instituted. The act of Congress for its establishment, a copy of which I have prefixed to this report. was approved May 15, 1862. It could not reasonably be expected that a new institution, of very important and extensive operations, could spring into existence entirely perfect. Errors of judgment attach to humanity; and sometimes frailties exist that permit us to be swayed from following our better judgment by outside pressure, by policy, and by other influences. While, therefore, it may be admitted that the department has accomplished much good for the country, in collecting and distributing valuable information on agricultural subjects, and awakening an increased interest in the important subjects intrusted to its vigilant regard, it becomes a serious and important consideration and inquiry now, in view of all the past facts, and with the experience we are in possession of, whether the department has done all the good it is capable of accomplishing, and whether changes cannot be inaugurated in its practical working which will render it more efficient in promoting the vast interest committed to its charge.

It would be gratifying to the Commissioner, as it undoubtedly would be to Congress, were the operations and existing condition of this department such as would, in every respect, fulfil the design contemplated in its establishment. Representing, as it ought to do—as it must do, indeed, if it is to be of any worth to the country—the vast interests of a constantly expanding nation, the Commissioner is constrained to say that thus far it has come short of the purposes which are legitimately within its embrace, and which, indeed, belong to it—purposes intimately associated with the national wealth and prosperity of a preponderating class of our people.

While the Commissioner has been made fully sensible, during the brief period which has elapsed since he assumed the duties of his position, how much has remained undone toward meeting these requirements, he is not disposed to animadvert upon the errors of the past, as concerns the direction given to its work; nor would he underrate or depreciate the efforts of those occupying subordinate positions in the department, who, with praiseworthy diligence and assiduity, devoted their talents and zeal in its service.

In order to bring the department into a healthy activity, and an efficient working condition, the present Commissioner, on entering upon his duties, found that immediate changes must be made—changes demanded alike by necessary economy, in husbanding the very limited resources at command, and that reform which was essential in order to place the department in a condition to work out its proper ends and aims.

It is frequently a difficult matter, as it is an ungracious task, to institute any reform; for there seldom can be reform, which has for its object the advancement of the public interest, which does not, in some way, act oppressively upon private individuals. The Commissioner could not but feel the force of this in bringing about the particular changes determined upon, inasmuch as there was involved in them the deprivation of employment to quite a number of both sexes heretofore, and for some considerable time, employed in the two branches of the department, known as the seed-room and experimental farm. The seed establishment had, practically, grown into a sort of fungus, of little value in itself, while it absorbed largely of the nutriment required to sustain the vital functions of the department. The experimental farm was to be classed under the same head, and liable to the same objections. These needed to be removed

in order to give vitality to the system. The Commissioner felt compelled to stop these drains upon the resources of the department, which were without any corresponding benefit to the country.

But the practical failure of the good results contemplated from the distribution of seeds is no ground for discouragement of the capabilities of the department in this respect. With the experience that has been acquired, and the opportunity afforded of observing wherein the system which was pursued has failed to meet the wants and equal the expectations of the people, and to be of that national benefit which would warrant the attendant expenditure, the department is the better prepared to inaugurate a system from which more propitious results may reasonably be expected. By the terms of the act establishing the Department of Agriculture, its duty in this matter is "to procure, propagate, and distribute among the people, new and valuable seeds and plants." Those seeds distributed under the law must be "*new and valuable.*" By the term "new" it is not to be understood merely that they are *fresh grown*, but that they are of a kind that has not been in use in the district or neighborhood to which they are sent; and by "valuable" it is to be understood that they possess some important quality above those of similar variety in ordinary use—as great productiveness, superior nutrition, more early or seasonable ripening, or some peculiar property which renders them worthy of being a gift from the nation to a neighborhood, including all the leading and most valuable cereal productions, such as wheat, corn, rye, oats, barley, &c.

And, moreover, it is very desirable and important that the reciprocal obligations of the recipient of such seeds from the department be properly and practically understood: that they are not given to him simply as an individual, but that they are forwarded to him as a member of the community in which he resides, who is confidently selected by the department to co-operate with it by bestowing careful and intelligent cultivation upon the seed intrusted to him, distributing a portion of its surplus yield to other members of the community, and, where there are peculiarly interesting and valuable results, communicating the information to the department.

In such a reorganization of the seed department, it is believed it can be placed upon a basis of extensive and permanent usefulness.

PROPAGATING GARDEN.

The importance of a propagating garden has been fully set forth in the report of Mr. Saunders, the superintendent, herewith submitted, marked A. In his report to this department for 1862, he represents the objects and aims of the experimental garden to be, among numerous other things not specified, the following:

1st. To procure and encourage the transmission of seeds, cuttings, bulbs, and plants, from all sources, both foreign and domestic, for the purpose of testing their merits and adaptation in general, or for particular localities of this country.

2d. To procure, by hybridizing and special culture, products of a superior character to any now existing.

3d. To ascertain, by experiment, the influences of various culture on products, and the modifications effected by the operations of pruning, and other manipulations on trees and fruits.

4th. To investigate more thoroughly the various maladies and diseases of plants, and the insects that destroy them.

5th. To provide ample means for thoroughly testing samples of all seeds and other contributions that may be received.

6th. To cultivate specimens of various hedge plants, and exhibit their availability for that purpose.

7th. To cultivate a collection of the best fruit trees and plants, such as apples,

grapes, pears, peaches, strawberries, raspberries, currants, &c., so as to compare their respective merits.

8th. To plant a collection of choice shrubs, adapted for decorating gardens and landscape scenery.

9th. To erect glass structures, for the two-fold purpose of affording the necessary facilities for cultivating exotic fruits and plants, and to furnish examples of the best and most economical modes of constructing, heating, and managing such buildings.

It will hence be seen, that on the vigorous and skilful prosecution of the various duties connected with this garden, many of the benefits derived to the country by the aid of this department in great measure depend.

* * * * * *

EXPERIMENTAL FARM.

Among the needed instrumentalities to be made available to the purposes of the department should be the enlarged experimental farm. To accomplish the full purposes of such farm, not less than 200 acres of land should be obtained in a conspicuous locality, upon some one of the great thoroughfares, within easy access from the city; a portion to be appropriated to the propagating garden, and the remainder to constitute the farm proper.

This land should present to the public eye its gradual development, and thus stimulate and encourage a spirit of improvement, checking the impoverishing system of agriculture, which is extending its baleful influence over the fertile regions of the west, and, if persisted in, will present in the not distant future visions *there* of the "barren old fields" so common in those districts where the same deteriorating system of farming has long prevailed.

This deterioration of the productiveness of the soil of our country is a great and growing evil, and the energy of the nation is demanded to check it, and to invite and guide those concerned into more healthful and productive methods of cultivation. No matter how fertile a soil may be, and how rich in all the elements promotive of vegetable growth, the removal from it of successive crops, year after year, without the return to it, in some way, of an equivalent, must necessarily exhaust the soil of some indispensable ingredients, and render it sterile. This must be the case, and the fact cannot be too soon recognized and guarded against. The points to which enlightened agricultural attention should be directed to prevent deterioration, are, first, to have all the waste matter on a farm—the bones, ashes, feathers, offal, manures, and excrementitious matters of all kinds, solid and fluid—properly protected and returned to the soil; and, secondly, a plan devised by which all these waste materials may be returned from the cities, where they are a nuisance, back to the soil, to maintain its fertility, to be followed with a judicious system of cultivation and rotation of crops.

A fundamental improvement in soil is that of proper drainage. It would therefore be necessary, as well as instructive, to exhibit the benefits of this operation, the best mode of accomplishing it, the comparative merits of deep and of shallow draining, and the gradual amelioration of soils thus operated upon, and its effects upon the crops with regard to their earlier maturity and increased productiveness in comparison with soil of the same quality, similarly situated and treated, but undrained. In farming, if in nothing else, example is more valuable than precept. In the fields, occular demonstration is at once the most silent and the most effective teacher.

The subject of farm enclosures, or fences, is one that has always been of vital moment. In many sections of the country the materials for this purpose are difficult and costly to procure, and, when timber is used, frequent repairs and renewals are necessary; consequently, live fences are being extensively introduced. It is still, however, very much a matter of experiment with many. There is yet

much to be learned with regard to the most suitable plants, and their adaptability to various climates. Specimen hedges will therefore form a feature of no inconsiderable merit, and as examples of what may be done, and how best to accomplish it, and cannot fail in imparting valuable instruction.

A complete system of farm accounts, exhibiting every item of expenditure for the renovation of the whole and each of the separate fields, buildings, fences, drainage, manures, &c., upon the various plans, together with the estimated working capital necessary to insure a profitable and satisfactory return, would be found of incalculable benefit to the country.

With the full co-operation of the laboratory, tests, under the direction of the best scientific knowledge, should be made upon the farm, eliciting and exhibiting every fact that could tend to bring about a more intelligent system of agriculture, and thus add to the interests of the farmer and the wealth of the nation.

The land of the farm should be laid out with the highest degree of artistic skill, combining the primary objects of utility with landscape effect, and making it at once attractive and useful, and supplying for the city of Washington, to some extent, the great desideratum of a public park or drive. Here also should be exhibited specimens of every variety of fruit known in the country, and these constantly increased by importations from abroad, together with choice specimens, in pairs, of all the various breeds of horses, cattle, sheep, swine, poultry, &c., of true types of their kind, selected with care and judgment. This would not involve any large outlay of money, and the sale alone of the offspring would more than pay the expenses incurred in making the collection, and the benefit to the country would be immense.

It is proposed to convert the ground surrounding the new agricultural building, formerly the experimental garden, into an *arboretum Americanum*, as heretofore recommended, and attach it to the propagating garden, and thus the initiatory step towards the development of an arboreal taste—a taste at once christianizing and refining, and in all its influences favorable to a people. The cultivation of a tree-planting taste is, in an eminent degree, important to our great West, and it must commend itself favorably to all.

It is true the space referred to is too limited for a very comprehensive collection of the vast varieties of useful and ornamental trees and shrubs which form the fine sylvan scenery of this country—much more so, if it is to embrace and acclimate all that is desirable from other countries; but extended to the ornamentation of the proposed farm and propagating garden, enough may be done to inspire a taste and a desire for a more intimate knowledge of this interesting and most important subject.

The general plan for the proposed improvement of these grounds may be better understood by an examination of the diagram accompanying this report. It is proposed by the Commissioner of Public Buildings, General Michler, to erect a permanent bridge over the canal at 13th street, directly in front of the northern gateway of the main building of the new agricultural structure, as shown in the diagram above referred to. It will be seen that this opens up that portion of 13th street which is now a most neglected district, and, when completed, it will add materially to the healthfulness and beauty of that part of the city.

STATISTICAL INFORMATION.

Among the chief purposes connected with the proper fulfilment of the objects of the Department of Agriculture, it must be conceded, is this: the obtaining of reliable statistical information, to be secured by a complete system of correspondence, leading out through the various State organizations—agricultural, horticultural, and pomological—and extending to the county and local societies in each State, where such exist; and where these do not exist, then through such reliable channels as may be most available and efficient. This correspondence,

to extend to foreign countries, bringing together a mass of useful information, with the experience gained on the experimental farm and in the propagating garden, in accordance with what has been previously stated in this report and in the report of Mr. Saunders, superintendent of the garden, will in a few years enable the department to inaugurate a system of charts, which will clearly define and climatize the whole animal and vegetable kingdom, their productiveness and adaptation to particular climates, as to the isothermal lines, the air currents, and their effects upon the temperature—a result of more importance to the science of agriculture than has ever been attained in any country.

With this in view, circulars have been issued, a copy of which, marked B, is herewith submitted, calling upon the various societies mentioned for their co-operation, thus drawing to the department valuable practical, statistical, and scientific information upon agricultural subjects from every part of the country, and the department reciprocating the favor by sending to each society and correspondent a systematically arranged digest of the valuable and practically instructive portions of the information received from all, thus bringing the beneficial influences of the department into immediate contact with the numerous institutions of our country which are occupied in the same undertaking—the promotion of the great interests of agriculture in all their various ramifications.

THE AGRICULTURAL MUSEUM.

The museum, under the care of the entomologist of the department, well deserves the fostering care of the government, forming as it does a nucleus of the most instructive of all collections, and properly and emphatically deserves the name he applies to it—"An Object Library, or Collection of Agricultural Facts." To be understood and appreciated the museum must be visited. The volumes of his library must be read in place.

As an illustration of its general plan, there are specimens, in composition, of model fruits of different varieties, and from all parts of the country, so perfect that, at a distance too great to be affected by the flavor, it would be difficult, if not impossible, to distinguish them from the genuine fruit; and near these, on plates colored to the life, the kind of insect that injures that particular fruit, or the tree bearing it; also the character of the different bird, its tastes and habits, and whether injurious or beneficial to the farmer. We thus have the best practical treatise upon the subject that can be prepared. The same kind of fruit, as of apples, grown in different latitudes being accurately represented, it can at once be seen in what latitudes that variety attains the greatest perfection; and thus a person who was about to plant an orchard would be able to learn by a visit to the museum the variety that would be best adapted to his particular locality.

When this general collection, improved and enlarged as it will be, shall be placed in the new agricultural building, exhibiting in separate sections the products and manufactures of the several States and foreign countries, we shall have in this "Object Library" the best possible history upon the subject attainable.

THE LABORATORY OF THE DEPARTMENT.

While the knowledge of general chemical principles has been of incalculable advantage to the agricultural interests, the laboratory has accomplished comparatively little in this direction, particularly in our country.

The analysis of the soils, as an unerring means of determining what applications of manures to make in order to secure a particular crop, is now given up as wholly unreliable. Besides the difficulty of procuring an exact sample or specimen of fields in the small quantity to be operated upon in the laboratory, so much depends upon the mechanical condition of the soil and the disintegrable character of the intermingled rocks—whether or not the frost will add a new dressing every season by crumbling the rock surface, and thus supplying the

soil some ingredients in which it might appear to be deficient—as to create a well-grounded distrust of the best laboratory efforts on this point.

But a wide field is still open for the effective use of this great instrument of enlightenment and progress in the interests of agriculture. The chemist of the department, Professor Antisell, in his report herewith submitted, marked E, justly observes, "that inasmuch as the greater portion of our knowledge of the constitution of food crops is derived from the analysis of European chemists made upon plants grown on that continent, and as the influences of climate and soil differ materially, owing to causes both climatic and terrene, it follows that the results of such researches, though true in Europe, must be unsafe guides here. Of our edible plants grown in American soil not more than a half-dozen have been examined by reliable American chemists. This deficiency of accurate information opens up a field in which a government laboratory might be occupied with advantage to the whole country."

Other problems of similar character remain undetermined which can receive definite solution only by the laboratory; such as, whether the same weight of grain, as of wheat, corn, oats, &c., grown in a wet season, and of that grown in a dry season, contain the same amount of nutritive ingredients. The same in regard to hay and other articles of food for stock or man grown in wet seasons and dry, on bottom or upland. The same as to the varieties of sugar cane, as to their percentage of saccharine matter, &c.

The suggestion of Professor Antisell, to have a museum of agricultural geology connected with the laboratory, is highly deserving of attention, and I commend it to your consideration. Such a museum as that of Professor Glover would be an "object library" of great utility; in another branch of the subject, a collection of agricultural facts in geology; and it would be highly instructive to those engaged in agricultural pursuits. As the loose soil and ground have resulted from the gradual disintegration of rock, including primitive clay in this class, which disintegration is still in progress by the action of frost, rains, &c., the kind of rocks or stones in a soil, or constituting the hills in its vicinity, affords the best indications that can be possessed of the general character of such soil. Now, it is too frequently the case that a farmer cannot give the names of the rocks or stones which are on his land, or describe them so as to enable the chemist to know certainly what kind they are; but when he sees them in a collection in such museum he will immediately recognize them in their different varieties, and point them out to the chemist as those with which he is familiar at home; and the chemist will at once know the general character of such soil, and be able to suggest methods of cultivation and improvement which have been found successful in similar soils.

Besides the kind of rock, its character and position greatly affect the soil in regard to its agricultural quality. Some limestones and some slates form almost continuous strata, nearly or quite impervious to water. If such rocks have an inclination to the horizon so as to "crop out" in places, and thence run deep into the earth in nearly parallel strata, with beds of earth between, the surface may be rocky and rough and harder to till, but the soil will be very productive, being annually dressed and nourished by the disintegration of the contiguous rocks. But if such rocks are in horizontal strata, forming beds within two or three feet of the surface, the soils will be of the most unreliable kind. In a season which is just favorable to them, neither too wet nor too dry, they may produce largely; but in a wet season they will be drowned, and in a dry season baked, in both instances rendering the best efforts for obtaining a crop comparatively unavailing.

Valuable information upon all such points could be imparted by a well-informed agricultural chemist, in possession of a geological museum, by means of which he would be enabled intellegently to understand the inquiries that might be made.

ORGANIZATION, ETC.

For the purpose of a better organization of the clerical and other necessary force of the office, I would respectfully recommend that the act of Congress approved March 15, 1862, establishing the department, be amended by supplementary legislation, so as to fix and define the disposition of its officers, as follows, that is to say: one statistician, one entomologist, one chemist, one assistant chemist, one superintendent of experimental garden, one assistant superintendent of experimental garden, one botanist, one superintendent of seed room, one assistant superintendent of seed room, one librarian, one disbursing and auditing officer, three clerks of the fourth class, four clerks of the third class, six clerks of the second class, seven clerks of the first class, five copyists and attendants on museum, one chief messenger, two assistant messengers, two workmen and six laborers.

Accompanying this report (marked G) will be found an estimate of appropriations necessary for the current expenses of the fiscal year ending 30th June, 1869, together with the amount required to enable the Commissioner to carry out the complete organization of the department as exhibited in the foregoing report.

I have thus endeavored, in obedience to the resolution of the House, to present a view of the present condition of the Department of Agriculture, and to indicate some legislation which it is believed would add to its efficiency in promoting the vast interests committed to its charge.

All of which is respectfully submitted.

HORACE CAPRON,
Commissioner of Agriculture.

Hon. SCHUYLER COLFAX,
Speaker of the House of Representatives.

REPORT OF THE SUPERINTENDENT OF THE EXPERIMENTAL GARDEN.

I have the honor to submit the following report of the operations under my charge. As inquiries are frequently made relative to the aims and objects of the experimental garden, the most prominent are recited as follows:

1. To procure and encourage the transmission of seeds, cuttings, bulbs, and plants from all sources, both foreign and domestic, for the purpose of testing their merits and general adaptation, or for particular localities of this country.

2. To procure, by hybridizing and special culture, products of a superior quality to any now existing.

3. To ascertain, by experiment, the influences of varied culture on products, and the modifications effected by the operations of pruning and other manipulations on trees and fruits.

4. To investigate more thoroughly the various maladies and diseases of plants, and the insects that destroy them.

5. To provide ample means for thoroughly testing samples of all seeds and other contributions that may be received.

6. To cultivate specimens of the various hedge plants and exhibit their availability for that purpose.

7. To cultivate a collection of the best fruit trees and plants, such as grapes,

apples, pears, peaches, strawberries, raspberries, currants, &c., so as to compare their respective merits.

8. To plant a collection of choice shrubs adapted for decorating gardens and landscape scenery.

9. To erect glass structures, for the two-fold purpose of affording the necessary facilities for cultivating exotic fruits and plants and to furnish examples of the best and most economical modes of constructing, heating, and managing such buildings.

Although progress in some particulars has been slow, yet the development of these objects is constantly kept in view.

Various circumstances have hitherto retarded the fulfilment of these designs. The limited area of the garden has prevented the extension of specimen orchards, and caused the abridgment of operations in many other respects. Even with the small fruits, although the collection is extensive, the means available for this purpose have not been such as to secure all the new varieties as they appear, thus greatly diminishing the usefulness of the garden, for, in order to be of any great value to the public, tests of new varieties should be promptly reported.

The great amount of time and labor necessarily occupied in the propagation and distribution of from 40,000 to 50,000 plants yearly should also be noted in connection with what may be considered the more legitimate objects of the garden.

The distribution is especially an absorbent, on account of the number of packages required in dividing these plants into lots of from 6 to 20 each, and the work of labelling and mailing—labors which must be performed at a season the most important of the year, so that the effects extend beyond the mere time actually occupied in the execution of the work.

EXOTIC FRUIT HOUSE.

The collection of exotic fruits is gradually increasing. The *Musa Cavendishii* fruits abundantly in about 18 months from suckers; young plants of this dwarf banana have been sent to Florida, where it will undoubtedly prove highly successful. Several varieties of the pineapple and several of the guava have also been transmitted to the most congenial portions of that State.

In the collection are promising plants of the mangosteen, tamarind, mango, *Cookia punctata*, *Euphorias*, Jambos apple, Indian persimmon, cherrymoyer, Sappodilla plum, &c.

These are successfully cultivated in boxes plunged in a bed of tan-bark laid over a cement tank. This tank contains about one inch depth of water, which is heated in the manner described in last report, as adopted in the propagating house. In this case a two-inch iron pipe is used, about six feet of which is enclosed in the furnace, very effectually keeping up a temperature of 75 degrees, in a bed 11 feet in width and 30 feet in length.

ORCHARD HOUSE.

The orchard house continues to give satisfaction. The planting of this house was mentioned in the report of 1863. The trees, as there stated, were planted in a shallow bed of rather poor soil, with a hope of obtaining all the advantages of pot culture in a simpler and more available manner, pot culture in this climate requiring great care and constant attention, any neglect of which will inevitably be followed by failure.

The depth of soil in the bed was originally about 10 inches. No additions have been made, and it is now thickly interwoven with roots. The surface has not been disturbed, even with a hoe, for three years; the trees being sufficiently vigorous, no operation of culture with a view to increased growth is necessary.

The crops of fruit have been greatly admired; the Stanwick nectarine, in particular, has annually produced abundantly of its large-sized fruit; specimens weighing 10 ounces each have been common. The Stump the World and President peaches have also proved well adapted to this culture.

The plants were originally set at three feet apart, but one-half have since been removed. This mode of planting and subsequent thinning is not objectionable.

For a family supply of fruit in climates where they cannot be relied upon in field culture, this mode of culture under glass may be safely recommended. The care required is of the simplest character. When first planted, even though the soil is very shallow, the trees may indicate a very luxuriant growth the first and second seasons; when this tendency becomes so great that the wood will be unable to ripen early, water should be withheld and the roots shortened by cutting around the trees with a spade. The red spider, so prone to attack the peach in a dry atmosphere, may be kept under by syringing or sprinkling the foliage with water twice a week in dry weather. This insect dislikes moisture When the fruit is swelling a sprinkling of guano, thrown over the soil and washed in among the roots, will materially assist the crop. During the process of coloring and ripening an abundance of air and sunlight, with a diminished supply of water, will increase the flavor. Fruits ripened under glass in a damp, warm atmosphere are generally tasteless. After the fruit is removed the trees should be examined, and all strong shoots that are not ripening should be entirely removed; this will tend to insure an abundance of fruit buds on the more slender but more perfectly ripened growths.

NATIVE GRAPES UNDER GLASS.

Four years ago, wishing further to illustrate that leaf mildew on native grapes was solely an atmospherical production, and for other experimental purposes, I planted a small collection in a rude glass structure, which will be best understood by supposing an enclosure made by placing a few glazed sashes against a common board fence. The grapes were planted on the outside in front, and in time two stems were secured from each plant, one of which was trained under the glass roof, and the other to a trellis set four feet from the outside of the front, fully exposed to the atmosphere. A width of four feet was dug up, about 16 inches in depth, for a border. The soil being rather poor in quality, a coating of manure was spread over it, as a mulch, after the vines were planted; this mulching has subsequently been annually renewed.

The experiment as regards mildew has been instructive, but the satisfactory results of the crop under the glass, and the great excellence of the fruit, when taken into consideration with the very small amount of cost and care required to produce it, induces the belief that if this mode of growing the best varieties of native grapes was more generally known, many would avail themselves of the suggestion.

There are many localities where the grape does not produce with uniform success, and in more only the hardier and, as it unfortunately happens, the most inferior varieties succeed; and in northern climates the season of growth is so short and capricious as to render grape-growing a very unprofitable culture. In all such cases the mode under consideration is to be recommended

The question has been put as regards the propriety or necessity of growing native grapes in this manner, when, with the same amount of trouble and expense, the finer and higher-flavored foreign grapes may be produced. My reply to this is that the foreign grape cannot be produced in equal condition with the same care and cost; and as regards the higher or finer flavor of the foreign varieties, there is much error extant. If we except the peculiar aroma of the Muscat varieties, there is probably no foreign grape that would be preferred to the Iona when ripened under these conditions; even as regards size and beauty of bunch

and berry, when properly thinned, they are all that need be desired. Then the Maxatawny, Delaware, and Diana are but little inferior, and, so far as variety of flavors is concerned, they are not surpassed even by the foreign sorts.

The southern varieties of chicken grape, such as Lenoir, Devereaux, and Herbemont, which rarely ripen to perfection in the northern States, can be matured in these structures. Although the berries of these varieties are small, they possess a piquant flavor altogether peculiar, and are very fine when in perfection. The care required in the management is of the most simple character. A glass roof supported on posts will answer every purpose except security against depredators. If the sides and ends are covered with common boards, ample ventilation being provided by openings on all sides, so that the roof may be permanent, and these openings covered with wire or other netting, birds and wasps would be excluded—both of which are frequently troublesome—and the building otherwise properly secured.

The daily routine of attention generally practiced, and supposed to be necessary, in the culture of the foreign grape under glass, is not required with the native varieties. The ventilation should be continuous—no closing up, unless it may be desirable as a security against unusually severe storms or during extreme colds in winter. A dry atmosphere after the fruit is set is rather favorable. If thrips are observed on the foliage, fumigations with tobacco will drive them out, and, the roots being in an outside border where they are under the influence of the natural atmosphere, the plants require no more of special attention than vines in the ordinary vineyard.

The subject is well worthy the attention of those whose situation will not enable them to secure fruit in open-air culture; and even in the most favored grape localities, to insure table fruit of the best kind, this plan will be found exceedingly satisfactory.

ARBORETUM.

In accordance with your instructions, I have prepared a plan for laying out the new grounds of the department as an arboretum.

The design includes a list of all trees and shrubs which are hardy, or supposed to be hardy, in this latitude, arranged in accordance with the classification of Dr. Gray, in his Manual of Botany, also with a due regard to landscape effect, the design being an endeavor to combine a complete arboretum, arranged in strict accordance with a botanical system, and at the same time produce a high degree of effective landscape gardening and pleasure-ground scenery, a combination not hitherto attempted on a similarly extended scale.

With regard to the value of an arboretum, it may be stated briefly that its utility is as obvious and important as any other museum of natural history—certainly not inferior to any in the intrinsic value of its connection with arts and manufactures, and presenting a school of instruction that will largely tend to advance our progress in the knowledge of vegetable physiology, and furnish a strong incentive to botanical studies.

Unlike many other museum collections, this will constantly vary in its beauty and attractions; the yearly development of individual forms, with its combinations of form, foliage, flowers, and fruit, the opening buds in spring, and the gorgeous hues of the autumn foliage, represent extreme periods between which each day has its own peculiar beauties.

To the artist such a collection presents a field where may be studied the form of every leaf and outline of the superior vegetation of the temperate zones, and the botanist will here find the material living presence of those objects which, in their more refined relations, enter into his abstract and recondite arrangements.

Such a collection of plants has been a long-felt want in this country, and it is doubtful whether any other can compare with it in arboreal wealth. The reports

of the Pacific railroad survey reveal a vast number of plants and trees, few of which have as yet been introduced to cultivation. It is to be hoped that efforts may be made towards gaining a more intimate knowledge of the botany of the western States and Territories, and living plants secured and placed in the arboretum.

Immediately in front of the Department building a design is introduced for a strictly geometrical garden, in order to produce an effective example of this style of improvement as a fitting accompaniment to such a structure—the only connection in which architectural terraces and similar features are admissible.

The roads and walks are so situated as to render access easy to all prominent portions of the ground. At no time do these form an essential feature in beauty of scenery; they are so entirely utilitarian in character that their beauty is one of necessity only

NOTES ON GRAPE CLIMATES

During the latter portion of the month of August I was authorized to visit some of the principal grape-growing localities in the States of New York, Ohio, and Missouri. Much valuable information was collected during the brief tour. The great extent and success of vineyard culture on the shores and islands of Lake Erie promised a field of much interest, and expectations were more than realized, both in extent of operations and results.

The influence of large bodies of water in ameliorating climates is well understood, and has been turned to practical advantage in this locality in the production of the Catawba and other grapes that ripen to great perfection under the lake influence, while further south and more inland these fruits are a very uncertain crop, seldom obtaining perfection before being cut down by the frost. The influence of the lake, with the accumulated heat of summer, in warding off, early fall frost, and thus virtually lengthening the season to an equality with climates of several degrees of more southern latitude, is happily accompanied with a hygrometrical condition of atmosphere which seems eminently congenial to the healthy growth of the grape.

The leaf mildew, owing to comparative freedom from heavy dews, is not so prevalent as to cause serious injury, although the plants are not altogether exempt from this malady; the rot in the berry is more frequently seen, especially on soils rich in organic matter; on black, mucky soils this disease is very injurious. It attracted but little attention until within a few years; now, however, it is assuming proportions calculated to excite anxiety.

Cincinnati and neighborhood has long been specially identified with the production of wine, and was for many years considered as possessing unusual climatic advantages for the culture of the grape. As vineyards extended over other and distant portions of the country it was found, on comparing results, that the supposed peculiar adaptability of that region was largely imaginative. Many of the older vineyards are on poor declivities, where they seem to have failed from sheer want of nutrition. It is also presumable that a management based upon the experience and practice of foreign vignerons has had an injurious effect upon the health of the American species and varieties.

Of late years many new plantations have been made, and the vines are more generously and liberally treated, both in regard to soil and manipulation. These present a very healthy and promising appearance, with no more than an average liability to disease, depending upon treatment and location.

Hermann, Missouri, may be cited as another representative point of grape and wine culture. Many varieties attain perfection here that fail to ripen in more northern regions. I have nowhere seen so many varieties in equal health, though such as are subject to rot in other localities are also similarly affected, and mildew is also more or less to be found, according to position and nature of varieties.

The supposition that successful grape-growing is confined to localities bordering on large bodies of water does not seem to be supported, at least to the extent claimed. It is a great mistake, however, to suppose that this claim is merely hypothetical. It has long ago been observed that the vicinity of lakes is exempt from early autumn frosts; thus the season of growth is greatly extended, and late varieties will ripen to a perfection that cannot be attained in localities many degrees southward, where the growth is destroyed by early frosts. The equable degree of atmospheric humidity and comparative exemption from heavy dews are conditions extremely favorable, as seen in the general healthy appearance of the vines, and although mildew may be occasionally seen on the foliage, it is rarely so prevalent as to seriously injure the crop.

Another example of a favored region is found at Hammondsport, Steuben county, New York. Here the Catawba and other late grapes mature, and their culture is rewarded by a remarkable degree of success, taking the latitude into consideration. These extensive vineyards are on steep hill-sides, extending for several hundred feet above the valley; the soil is a drift formation, and the surface is thickly covered with loose shale; in many acres the soil seems completely covered with stones. The influence of Keuka lake is supposed to account for the success of this locality, but some of the best vineyards are so far from the lake that its agency can have but little if any effect on the climate; the body of water is also too limited to effectually lengthen the season of growth, as is unquestionably the case on the shores of the great lakes. The adaptability of this locality for grapes may be attributed to the nature of the soil and the configuration of surface. The deposition of heavy dews is prevented owing to the great elevation, combined with the heat absorbed during the day by the abounding stony surfaces, so that the plants are exempt from mildew, and the foliage uninjured until growth is checked by frost. The soil is of a character that insures a healthy but not an over-luxuriant growth; the wood matures as it grows, a valuable condition not always realized. There is no excess of succulent vegetation; even the extremities of the branches are brown and hard before the crop is gathered. The excellent quality of grapes ripened under such favorable circumstances cannot be questioned.

The distinguishing peculiarity of a good grape climate is that of the entire absence of mildew on the foliage. This statement is made with a knowledge of the disastrous effects of rot in the berry, which is found occasionally in sections where leaf blight is seldom seen, and in such sections is properly considered the greater evil of the two; but if we sum up the experience of grape-growers throughout the country we shall find that success or failure of varieties are wholly dependent upon the absence or presence of mildew. The Delaware may be noticed as a variety not subject to failure from rot in the berry, ripens early enough to be available over as great an extent of country as any kind in cultivation; has intrinsic merits that would place it even in the most limited collection, but it is so liable to mildew as to restrict its culture to a few certain or rather uncertain localities. It cannot be planted with the same freedom as the Concord, Perkins, Ives, and others of equal hardiness in resisting mildew. Even the foreign grape succeeds admirably if protected from mildew, and only for this disease could be cultivated with as much certainty as the Concord.

It is a difficult matter for those who are fortunately placed in favorable localities, and whose observations have not extended beyond their immediate neighborhood, to realize the extent of this disease; they are under the impression that its importance is exaggerated. A moment's consideration might convince them that if the disease did not exist there would be no occasion for allusions to it.

Seeing that the hygrometrical conditions of the atmosphere have so much influence on the health of the grape, it becomes a leading question how best to reach a knowledge of suitable localities. I conceive that this may be ascertained from a series of systematic and thorough hygrometric observations, both

in localities known to be favorable as well as in those where failures constantly occur. By this means facts may be accumulated regarding the actual degree of humidity in the air most favorable to the development of grape fungi that will enable us to test, by proper instruments, the adaptability of any locality for successful grape culture, and avoid the many disappointments and losses consequent upon the absence of accurate data on this subject.

So far as present knowledge warrants an opinion, a good wine-growing region is one where the season of growth is of sufficient length to ripen to perfection our best wine grapes, exempt from late spring frosts, heavy summer dews, and early frosts in autumn. There are many points in the northern and western States where all these conditions exist, so far as refers to the varieties of the Labrusca and Cordifolia species; but, entertaining the opinion that the southern varieties of the chicken grape, such as Lenoir, Devereaux, Herbemont, Norton's Virginia, Cynthiana, and Cunningham, will produce a distinct class of excellent wines, (if they do not ultimately take the lead in this production,) we must look to regions where these varieties can be matured.

About 10 years ago Mr. Silas McDowell, of Franklin, Macon county, North Carolina, directed attention to the "Belt of no frost, or Thermal belt," on the slopes of the southern Alleghanies. Various communications were published by Mr. McDowell, which attracted notice at the time. Convinced that these observations were of great value, and directly applicable to our subject. it may not be out of place to quote from the more recent of these letters:

Among the valleys of the southern Alleghanies sometimes winter is succeeded by warm weather, which, continuing through the months of March and April, brings out vegetation rapidly and clothes the forests in an early verdure. This pleasant spring weather is terminated by a few days' rain, and the clearing up is followed by cold, raking winds from the northwest, leaving the atmosphere of a pure indigo tint, through which wink bright stars, but, if the wind subsides at night, the succeeding morning shows a heavy hoar frost; vegetation is utterly killed, including all manner of fruit germs, and the landscape clothed in verdure the day before now looks dark and dreary.

It is precisely under this condition of things that the beautiful phenomenon of the vernal zone, or thermal belt, exhibits itself upon our mountain sides, commencing about 300 feet vertical height above the valleys, and transversing them in a perfectly horizontal line throughout their entire length like a vast green ribbon on a black ground. Its breadth is 400 feet vertical height, and from that wider, according to the degree of the angle of the mountain with the plane of the horizon. Vegetation of all kinds within the limits of this zone is untouched by frost; and such is its protective influence that the most tender of our native grapes has not failed to produce abundant crops in 26 consecutive years. The thermal belt must exist in all countries that are traversed by high mountains and deep valleys, as the natural causes that produce it are as infallible as those which produce the rainbow in the clouds.

The philosophy of the subject is described as follows:

Frost is but crystalized dew, and can only form during clear, still nights, when the atmosphere is in repose. The atmosphere, when at rest, falls into a series of strata, one lying above the other, the heaviest stratum becoming the base of those above it, and all take positions according to their weight and density, upon the principle of gravitation.

Heat is the agent that produces this result. The heat is of two kinds, both from the same source; the primary one being the sun's rays direct, and the other the heat reserved or retained by the earth. This heat is ever radiating, and in cold, clear, still nights it mounts upward through the cold, damp air, taking from it its caloric, while the latter rushes down in a cold frost, producing currents, and hence the lowest ground in a valley is ever subject to the hardest frosts. The warm, dry, light current keeps mounting upward like cork in water, until it reaches a stratum of atmosphere too thin and light to support it, when it consequently falls back and forms its warm, dry, genial stratum upon the top of the lower or frost stratum: and hence in cold, frosty nights is produced the phenomenon of the vernal zone.

It is a fact that can be well attested, that all attempts to cultivate the grape in our low, damp valleys have utterly failed, the plants being attacked by what is called the mildew-blight; while the few vines that grow upon the small farms lying high upon the mountain sides have ever matured their fruit in the greatest perfection, and the true reason of this is that all good varieties of grapes are of tender organization, and easily affected by a damp atmosphere and chill dew. And on the mountain, being within the comparatively dry thermal zone, they grow in an atmosphere peculiarly adapted to the delicacy of their tender

organization. In view of these facts, I say confidently that any well conducted effort at grape culture will succeed, whether it be upon the slopes of our Alleghanies, or upon the mountain sides that skirt the valleys of the northern States, and all that is required to insure success is to ascertain where this thermal belt is, and to plant the vine within its limits.

As may be readily imagined, this belt varies in its height above the valleys, according to the configuration of the country, independent of the height above the level of the sea; there cannot be any doubt but that, either by observations on vegetation or by instrumental tests, these favorable zones will be determined, and grape culture reduced to a certainty, instead of being a matter of individual experiment, as it is at the present time.

IMPORTANCE OF A UNIFORM SUPPLY OF WATER IN PLANT CULTURE.

If there is any one element in plant growth of more importance than another, it is water. Crops usually fail or succeed in proportion as they receive an equal distribution or uniform supply of this element. Failures are more frequently referred either to a deficiency or to a surplus of rain-falls than to any other cause. Hence one of the chief essentials to culture is to maintain the presence of a proper amount of available water to crops, and, as far as practicable, guard against excess on either side. And this is entirely within the control of the cultivator; the three operations of draining, subsoiling, and mulching, when properly understood, comprise all the requisites of success, and enable him, in a very great measure, to regard with comparative indifference whether the season prove unusually wet or unusually dry; if the former, the drains remove all superfluous water, and the loosening of the subsoil allows the egress of water through all its pores, which are speedily filled; and mulching the surface, so as to prevent evaporation, retains the water where plants can reach it, instead of its being rapidly consumed by drying winds sweeping over the soil.

Of all operations relating to soil culture, there are none whose value is so well established as these, and yet they are operations to which the great majority of cultivators are strangers. Crops may be deluged, starved, for want of proper depth of soil, or burned up by drought and heat, yet the well known remedies against such extremes, are practically ignored.

Objectors to draining frequently argue that in a climate subject to long-continued droughts it is worse than useless, as it would still further increase the evils resulting from a deficient supply of moisture. It seems not to be generally understood that draining in connection with proper culture, increases the capability of the soil for absorbing and retaining moisture. Place a sponge in a tight vessel and sprinkle it with water; for a time it will all be absorbed, but as soon as the pores are filled it ceases to be taken up. Soils act in a similar manner. They also have their respective absorbing capacities, varying, of course, according to their nature, whether a compact clay or a peaty morass. The last is of such an absorbent character as to be commonly designated spongy. The object in draining is simply to allow the superfluous water to pass off. No water can reach the drains until the pores of the soil are satisfied or filled. It is therefore evident that the deeper the soil is drained the greater becomes the reservoir of contained moisture, so that on soils of a gravely or sandy nature a more luxuriant vegetation will be produced after they are artificially drained. With clay soils this improvement is still more obvious; no good clay soil can be considered in best cropping condition until drained. Tillage, manures, and seed are to a certain extent wasted on the best clays without this fundamental improvement.

The utility of deepening the soil cannot be questioned. In common parlance a good soil is seldom mentioned without the addition of the word *deep*, thus testifying to the value of this property, yet how few make any attempt to deepen a shallow soil. The probability of bringing to the surface a poor strata has been given in argument against subsoiling. Even if this were the result it would be

an additional reason in favor of the process, as it would place the soil where it can be enriched; but subsoiling proper only loosens the under strata. Trenching, which implies a reversal of the soil, may occasionally afford grounds for this objection, at least for a time, until it becomes properly ameliorated.

Draining and subsoiling therefore increase the amount of available moisture in the soil. To keep it there for the benefit of vegetation, and prevent its escape by mere surface evaporation, we have recourse to mulching. As it is generally known, this operation consists in covering the soil with any loose material, such as straw, wood chips, tan bark, &c., and although it may not be practicable to carry out this process to any great extent in agriculture, yet in orcharding, and indeed all tree culture, as well as in the case of small fruits, it is a commendable practice, the advantages of which are well authenticated. Especially in newly formed plantations is its great value conspicuous; not only is evaporation arrested, but the soil is secured against the compacting effects of heavy rain falls, weeds are kept down, and root growth encouraged. But where it is not expedient to apply foreign matter to the surface an efficient substitute can be had in the soil itself, by simply keeping the surface loose by cultivation. A few inches of loose, powdery soil on the surface forms a capital non-conducting stratum, and likewise has the great advantage of being easily secured.

It cannot be too often repeated that the three cardinal operations in soil culture are draining, subsoiling, and mulching.

WILLIAM SAUNDERS.

Hon. HORACE CAPRON, *Commissioner.*

REPORT OF THE CHEMIST.

SIR: I have the honor to submit the report of the chemical division of this Department for the year past, embracing a statement of the work done in the laboratory during that period.

In reviewing the variety of the operations carried on therein, I am happy to say that it corresponds more nearly than hitherto to what properly belongs to agriculture, and that much of the assistance before lent to private enterprise has been withheld. The efforts which have been made to effect a change in the employment of the laboratory by directing its labors to subjects of importance to scientific agriculture have been in part successful.

A number of analyses not in the special domain of agricultural chemistry have been made at the solicitation of correspondents of the Department. The following classification represents the variety of that portion which was deemed worthy of examination and report.

Abstract of the variety of analytical work performed in the laboratory during 1867.

Earth paints.
Fullers' earths.
Steatitic clays.
Ferruginous clays.
Silico-aluminous clays
Argillaceous clays.
Calcareous clays.
Limestones in variety
Calcareous minerals.
Roofing slates.
Varieties of pyrites.
Bituminous shales.
Blendes.
Copper ores.
Gold ores.
Silver ores.
Iron ores.
Wine from wild grapes, Massachusetts.
Wine from California.
Wine from Missouri.
Wine from New York.
Wine from North Carolina.
Mineral waters from District Columbia, Virginia, Maryland, and Illinois.
Shell marls from Mississippi, Virginia, and Maryland.
Green sand marls from Maryland and Virginia.
Stone marls from Mississippi.

Also examinations for other departments of the government.

During the summer and autumn the laboratory has been occupied with a series of experiments upon the absolute growth and relative saccharine richness of the sugar beet. In the report of last year I called the attention of the late Mr. Newton (Commissioner) to the great importance of devoting the efforts of the Department to the sugar interest of the country, and coupled with it the necessity of placing the growth of the sugar beet and sugar manufacture from it more prominently before our people as a new industry, and a source of great national wealth.

Considering the great extent of territory of the United States, and how large a portion lies under the south temperate zone, it is remarkable how few plants have been cultivated for their value in sugar. To show this fact it is only necessary to submit the following table:

Amount of sugar and molasses produced in the United States in 1860, *from the eighth census United States.*

Cane sugar, in hogsheads of 1,000 pounds each	230,982
Maple sugar, in pounds	40,120,083
Molasses, of cane, gallons of	14,963,996
Molasses, of maple, gallons of	1,597,274
Molasses, of sorghum, gallons of	6,698,181

Of the 230,000,000 pounds cane sugar raised in the United States Louisiana had produced, up to 1860, 221,000,000 pounds.

The importations of sugar into the United States in the same year (1860) were as follows, (from Commerce and Navigation Report, 1860:)

Brown sugar, pounds	692,944,872
Loaf and refined, pounds	771,334
Molasses, pounds	86,352
White clayed powdered sugar	1,035,639

These figures show how small a proportion of the sugar consumed in this country has been raised within its limits; this, too, in a year during which there was no unusual interference with the industry.

The country should be able, under an improved system of agriculture, not only to supply its own demand for this necessary article of diet, but should also be able to export a surplus each year to Europe. To give an idea of the extent of the European demand the following table is taken from Stammer's Jahres bericht der Zuckerfabrikation, 1866:

Sugar consumption in Europe in the year 1865.

Country.	Population.	Weight in Zoll-verein cwts.	Consumption per capita in lbs.
Belgium	4,370,000	568,020	13.00
Denmark	1,500,000	170,000	11.33
Great Britain and Ireland	30,000,000	11,028,200	36.66
France	38,000,000	5,587,980	14.70
Greece	1,000,000	66,613	6.76
Hanseatic towns and islands	900,000	231,668	25.66
Holland	3,000,000	403,890	13.46
Italy	21,500,000	1,093,127	5.00
Austria	38,259,470	1,110,591	2.92
Portugal	3,800,000	250,000	6.58
Russia	80,000,000	1,330,000	1.66
Sweden and Norway	3,500,000	410,914	11.74
Switzerland	2,500,000	264,685	10.60
Spain	16,000,000	1,026,291	6.41
Turkey	15,000,000	476,088	3.00
Zollverein, (Germany)	34,670,330	3,428,639	9.29
	294,000,000	27,416,715	9.33
Minor European states		4,259,782	
Total		31,676,497	

To meet this demand sugar is supplied in the following channels, and from only two botanical sources, viz., the cane and the beet:

Beet sugar production and colonial sugar entries in Europe in 1865.

Country.	Cane sugar imported, in Zollverein cwts.	Beet sugar produced, in Zollverein cwts.	Total, in Zollverein cwts
Great Britain and Ireland	11,382,895	....	11,382,895
France	4,573,360	3,800,000	8,373,360
Holland	2,292,000	70,000	2,362,000
Spain	1,092,723	....	1,092,723
Portugal	250,000	....	250,000
Belgium	200,000	500,000	700,000
Denmark	500,000	....	500,000
Sweden and Norway	357,000	....	357,000
Hanseatic and other ports	507,000	....	507,000
Zollverein	....	3,600,000	3,600,000
Austria	....	1,300,000	1,300,000
Russia	....	1,000,000	1,000,000
Poland	....	300,000	300,000
Total	21,155,427	10,570,000	31,725,427

A glance at this table shows that after only half a century of existence the beet-sugar production is one-third of the total supply, and is every year increasing. The following return for 1866 shows that this production rose above one-third of the total, and this allows a greater consumption per individual, which in one European country (Russia) was as low as 1 $\frac{66}{100}$ pounds per head, or $\frac{1}{20}$ of what is consumed in Great Britain.

European beet sugar production for three years ending 1866.

Country.	1865–'66, in Zollverein cwts.	1864–'65, in Zollverein cwts.	1863–'64, in Zollverein cwts.
Germany, (Zollverein)	3,698,825	3,413,214	3,023,600
France	5,354,940	2,980,280	2,169,340
Austria	1,350,000	1,691,280	1,169,057
Russia	1,000,000	1,534,505	1,413,263
Belgium	831,037	437,896	400,620
Poland and Sweden	300,000	230,000	217,517
Holland	70,000	50,000	50,000
Total	12,604,802	10,337,175	8,443,397

The circumstances at the close of our civil war were such that the cultivation of the sugar cane as a branch of industry was completely arrested, and has not since been resumed. The only sugar produced in this country is that of the maple, which is limited in extent. The attempt to separate and crystallize the cane sugar of sorghum on a large scale has been wholly unsuccessful, and as a sacchariferous plant it is only valuable for its molasses.

In view of these conditions of sugar growth it appeared to the chemist that some experiments should be made by this department to aid the efforts of various cultivators in the western States to manufacture sugar from beets.

The advantage of the cultivation of beets for sugar rests upon many valuable

recommendations. To the farmer it is a crop demanding less time and labor than the sugar cane; an acre of beets requires 45 days' labor of one man and 14 days' labor of one horse. The produce is, as before stated, over 9 cwt. 2 qrs. Under the longest system of cultivation the ground is occupied eight months. According to the United States Census Reports, (agriculture,) 1860, "a domain of 360 acres in the south is worked by 150 negroes, which, reckoning the time the crop is on the ground at 14 months, would bring the number of days' labor by one man to 177 per acre." According to the same authority an acre of land in sugar cane yields in 14 months 15 cwt., 1 qr., and 10 lbs. Remarking upon this the superintendent of the census says: "Such an expenditure of labor must, in the nature of things, absorb the greatest part of the profits; and it was shown that the cost of cultivation and manufacture of cane sugar was equal to the value of the produce." In the altered condition of the laborer in the south, and the consequent subdivision of land, we may look upon the culture of sugar from the sugar cane as abolished as a branch of national industry; the winter climate of the south shows it to be less favorable than that of the West India islands, and other crops requiring less time and labor will necessarily be grown in a newly established rotation.

The value of the beet cake, or the residue after the pressure, is very great when used as a food for cattle. It is both nutritious and agreeable, containing a considerable amount of sugar which under the ordinary processes is not removed, besides all of the albuminous or protein-yielding nitrogenous matter, so that a large amount of manure is thus secured in the most profitable way. During the late growth it is often customary to remove some of the leaves of the plant, and thus a large amount of fresh food is secured during the period of growth. The fact that the cane refuse, or bagasse, if not fit for food, is useful as fuel in boiling the juice, is not an equal set-off to the manure value of the beet, since under sugar-beet cultivation no farmer will think of manufacturing sugar on his own farm.

The earlier attempts made in this direction in this country have, until very lately, proved unsuccessful, owing perhaps to want of appreciative combination between the grower and manufacturer. To be successful the beet must be grown on a large scale, and the sugar manufactured on an equally extensive plan. No efforts of individual farmers nor small combinations of rural districts can be successful, since large capital and improved machinery are necessary for economical production.

When we consider that a rural establishment in France will operate on not less than 5,000 kilograms per day, 150,000 kilograms per month, or 1,500,000 kilograms in the season, it may be seen that the manufacture can only be carried on by copartnership with large farmers, who can forego immediate returns, and also derive further profit from alcoholic distillation; and that the small producers of ten, twenty, fifty to a hundred tons of beet (a numerous class) would be outside of these operations.

To make the cultivation a success, it also needs amelioration of soil by judicious rotation, full use of residues, and rational choice of manures; a greater solidarity between farmers and manufacturers; between the workshop and the farm, and between him who sells and him who manufactures; when the beet will be bought according to its value in sugar, and when factories will be built by the formation of farmer companies.

Much of the success of beet-sugar manufacture in Europe is due, not merely to the improved treatment of the juice and to new machinery, but also to the selection of improved varieties of the beet. Dubrunfaut in his work, "Art de Fabriquer le sucre de betteraves," Paris, 1825, quoting from Payen, in the Technological Dictionary, gives the Beta Silvestris as the first variety, and Beta Alba as the second, with other varieties and sub-varieties of less value—as the Castelnaudary, &c. The order of richness in sugar was: 1st. Beta Alba; 2d.

Castelnaudary. The varieties of Beta Alba have been multiplied since, and better races now supplant the older ones, the Castelnaudary having almost disappeared. Those brought into notice by M. Vilmorin are much cultivated in France; the Magdeburg and Silesian beets are largely grown in Germany.

Believing that differences in climate in the two continents, not hitherto appreciated, might have some influence in varying the amount of sugar which the beet in Europe has been proved capable of yielding, and that this variation might be recognized by cultivation under such surveillance that the climatic conditions should be accurately known, I placed the subject under the notice of the late Commissioner, Mr. Newton, requesting that a series of experiments on the growth of reliable French beets might be carried out on the experimental farm during the year. Mr. Newton immediately gave the necessary instructions to obtain the seed and have the beets raised in the way indicated. Upon these plants the experiments now detailed were conducted.

The cultivation was not carried out in a careful manner, and the roots were neither so large nor saccharine as M. Vilmorin states them usually to be when grown in France. The varieties were sown upon soils of different tenacity and richness, and the drainage was not uniform—a fact which, taken in connection with the rain-fall, will explain the sudden weekly variations in the percentages of sugar.

In cultivation the beet succeeds wheat or oats. An ordinary rotation in France is: 1. Barley, or wheat, with manure. 2. Beets. 3. Oats. The beet should be sown as late as possible, on ground which is not highly or freshly manured, as in such case it will run into top, throw out too much root and augment the proportion of water, at the same time gaining a disagreeable taste. The latter was believed to be due to the entry of ammoniacal salts into the root, derived from the decomposition of animal manures; but Michaelis has shown, with some reason, that ammoniacal salts do not exist ready formed in the juice, but are the products obtained by treatment with lime or other alkaline bases. Whether this be a constant fact or not, it is certain that fresh manures diminish the percentage of sugar, both relatively and absolutely, as is noticed further on in detailing the experiments of M. Corenwinder.

It would be hasty to make any approximate statement of the amount of manufactured sugar which an acre of sugar beets grown in this country can produce, as enough is not yet known of actual growth in various latitudes to determine the average yield. The beet grown in France in 1844 yielded from 7 to 14 tons, and averaged from 7 to 8 per cent. sugar in the juice, while scarcely more than 4½ per cent. was separated. From 10 to 12 tons is an average crop in that country. At 10½ tons the produce of sugar per acre is 9 cwt. 63 lbs., or 1,071 lbs., instead of 1,881, (the yield of 8 per cent. sugar.) The richness of sugar is ordinarily in the inverse ratio of the size of the beet, and in the direct ratio of its density.

In declaring what sections of our vast country are best adapted to the growth of the sugar beet, we may be assisted by referring to the conditions of temperature, moisture, and general climate which are found to exist in the European beet-growing regions.

Early in the history of this industry the roots were grown in the south of France, and it was believed that a warmer summer led to more saccharine juice; but experience has shown that the juice of southern France was less saccharine, and the cultivation is now limited to the north and middle of that country. The latitude of 45° has been asserted to be the southern limit of the sugar-beet culture in France; latitude, however, is a poor guide on this subject, since an examination of the isothermal and isotheral lines will show that, as a continent is variously warmed in proportion to its low level and proximity to large seas, so the temperature must vary in proportion, and follow the line of the long axis of the elevated land. The countries of Europe in which the sugar beet is culti-

vated are chiefly the elevated lands, or the plateau of middle of Europe, being extended plains watered by large rivers and forming the water-sheds or divorts of many of the largest waters of that continent. This large tract of land is well moistened by summer rains, and it appears that the beet grows better and is richer in sugar when the rain-fall is greatest in summer. The beet must have abundance of rain during the spring and summer months.

The experiments in this laboratory show that no real growth of vegetable tissue is made after the middle of September, from which date the alteration in weight and the amount of juice vary with the rain-fall of the period; but there is no real growth, and hence the autumnal rains have no reference to the success of this industry. This explains why the European sugar beet has become valuable in proportion as it travelled northward. On the shores of the Mediterranean it is poor in sugar. North of the Alps, from the mountain country of southern Germany to the mouths of the Elbe, from the shores of the Baltic to the mouth of the Vistula, the sugar beet flourishes, even with a winter temperature down to +10°. As the plant is a biennial and can endure considerable cold in winter, the climatic condition of heat which favors its growth is a warm summer temperature with a high rain-fall. This condition exists in the north and middle of France, over nearly the whole of northern and southern Germany, north of Vienna, all of Poland, Gallicia and Russia, and eastward over the great plains of eastern Europe, embracing the country of the upper waters of the Dniester, Prepel, Dnieper, Vistula, Don, Dwina, Volga, and Koma rivers. This region gives a summer temperature from 55° to 74° F., and a winter mean from 32° to +10° F.

The beet region of France already alluded to conforms to these conditions, its isotheral lines including a mean summer temperature varying from 60° to 74°, while its isochimenal (or winter) lines run somewhat below 32°. The total annual rain-fall of northern France is 22 inches; that of southern France 23, and western France 24; yet the south of France, as mentioned, is not nearly so favorable to the sugar interest, for the reason that, although the total rain is equal to that of the other regions, but a limited amount falls during the summer, the wet season occurring in autumn. The mean annual fall of rain over the rest of France occurs so that in the north of that country the excess is in summer rather than in spring; while in the west the rain-fall of spring is the greater. The average annual depth over France is 23 inches by the rain-gauge; over northern and southern Germany the annual fall is 26 inches and 21 inches respectively; 37 per cent. of this occurring in summer, and 21 per cent. in spring. All of these countries yield a large amount of sugar in the juice.

The success of raising beets for sugar in Spain has not been promising. Almost the whole of that country lies in the region of autumnal rains, having a total rain-fall of 30 inches, 32 per cent. of which occurs in spring, and 29 per cent. in summer. A liberal supply of rain during the growth of the root appears to be necessary to convert a portion of cellulose into sugar. After the first of September no further active formation of cellulose takes place, the gain or loss of weight in the roots being due to the imbibition of more or less water by the rootlets, which only serves to dilute the sap rather than to increase the sugar, and thus autumnal rains do not aid in maturing the juice.

As the causes which regulate temperature and moisture operate over the United States in a direction chiefly from north to south, rather than from east to west as in Europe, the belts of temperature corresponding to those of Europe are wider from north to south, hence a great extent of land is favorable to the adoption of this industry. The extreme south of this country is of course unfitted, and no line of latitude can here define the northern or southern boundary, since latitude and climate do not correspond. If a summer temperature of 77° F. be esteemed the highest for favorable culture, then the southern limit would begin at the southern line of Virginia, on the Atlantic, reach latitude 35° in North Carolina

and Tennessee, running south of Louisville, and from thence to Fort Leavenworth, and from that point to the Llanos Estacados of northwest Texas.

The northern limit of beet culture is doubtful. On the plains of Russia it is grown where the isochimenal line is —10°. If this would hold good on this continent, there is no portion of the United States too cold for its culture. This vast extent of country is naturally divided into two regions, viz: 1. The middle division of the temperate zone of the United States, lying between parallels 39 and 43, comprising Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Ohio, Indiana, Illinois, Iowa, Nebraska, southern Idaho, and Oregon, with an area of 453,000 square miles, is favorable to beet culture, the mean annual temperature varying from 47° to 53° F. 2. The district between parallels 36° and 39°, embracing the border States, Delaware, Maryland, Virginia, West Virginia, Kentucky, Tennessee, Missouri, with Kansas, Colorado, Utah, Nevada, and northern California, possessing an area of 676,000 square miles and a mean annual temperature of 50° to 60° F., is also favorable to the culture of the beet; so that a belt of country seven degrees wide in latitude, and with an extent of 1,129,000 square miles, is open to this industrial art.

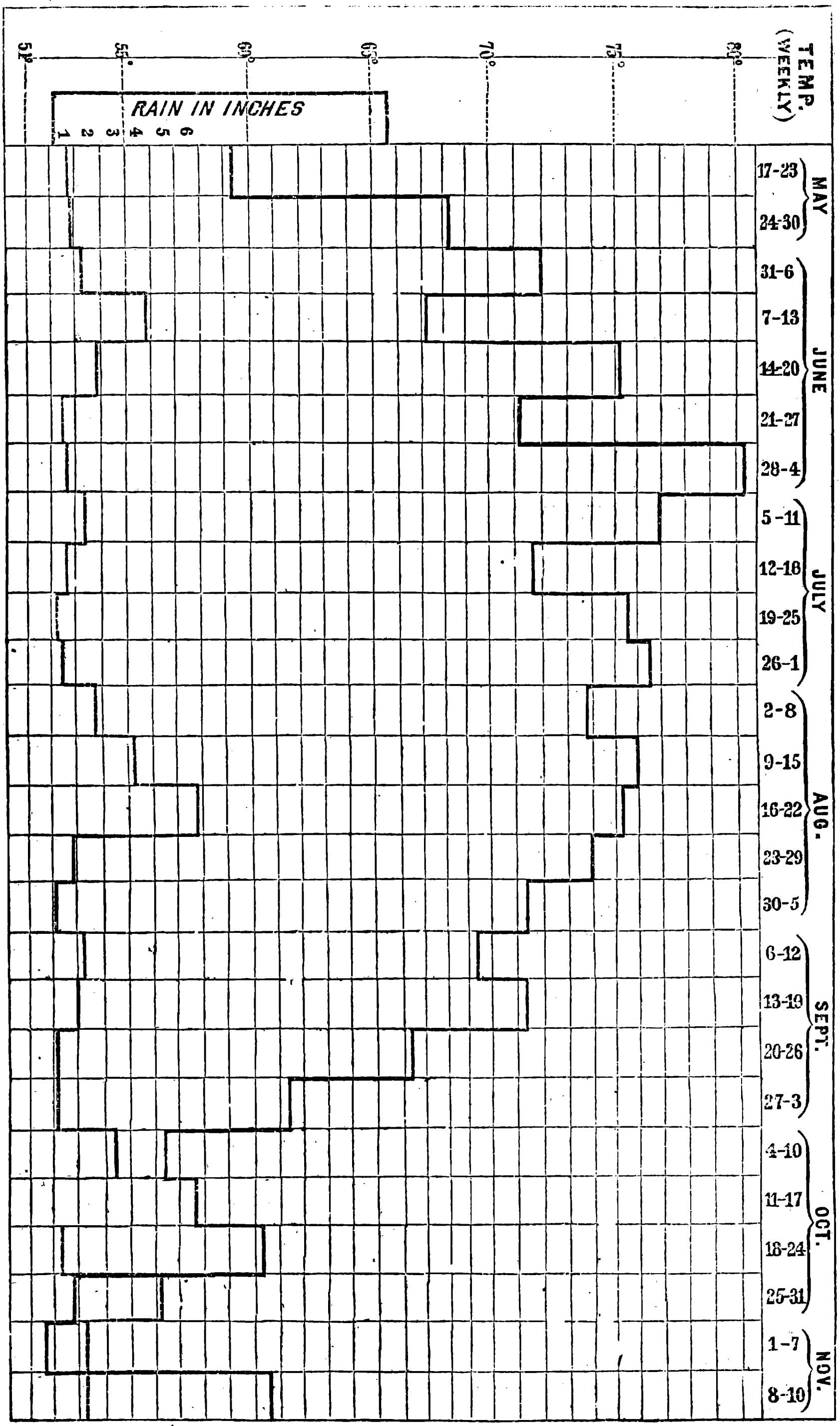
North of 35° to the northern boundary line there is not less than 10 inches of rain in summer in the seaboard States, increasing in the Mississippi valley region to 14 inches and 15 in Ohio and Kentucky, and as far as 96° west longitude. Over the same region in spring there is a fall of 10 inches, increasing in the centre of the valley and reaching 13 inches in some places close to parallel 55°.

Having thus called attention to the important subject of the relation of climate to beet growth, a recital of the operations conducted upon the beets grown for the special purpose of determining their value in sugar under certain climatic ranges is subjoined. In the first place it was deemed necessary that a knowledge of the range of the temperature and fall of rain should be secured as accurately as possible, so that the general rate of growth and augmentation in sugar might be determined in relation to temperature and moisture.

Mean temperatures (weekly) and rain-fall from May 17 to November 10, 1867.

	Inches of rain.	Mean temp.
May 17 to May 23	0.60	59.21
May 24 to May 30	0.70	68.21
May 31 to June 6	1.20	71.96
June 7 to June 13	3.80	67.23
June 14 to June 20	1.50	75.16
June 21 to June 27	0.45	71.17
June 28 to July 4	0.50	80.44
July 5 to July 11	1.22	76.83
July 12 to July 18	0.70	71.68
July 19 to July 25	0.15	75.70
July 26 to August 1	0.35	76.46
August 2 to August 8	1.80	73.87
August 9 to August 15	3.23	76.27
August 16 to August 22	5.90	75.41
August 23 to August 29	0.95	74.00
August 30 to September 5	0.10	71.44
September 6 to September 12	1.10	69.33
September 13 to September 19	1.00	71.41
September 20 to September 26	(*)	66.40
September 27 to October 3	(*)	61.68
October 4 to October 10	2.60	56.47
October 11 to October 17	0.00	57.73
October 18 to October 24	0.20	60.51
October 25 to October 31	4.25	52.90
November 1 to November 7	1.20	51.47
November 8 to November 10		60.73

* Very slight.


TEMP. (WEEKLY)
50° 55° 60° 65° 70° 75° 80°
RAIN IN INCHES
1 2 3 4 5 6
MAY 17-23 24-30
JUNE 31-6 7-13 14-20 21-27 28-4
JULY 5-11 12-18 19-25 26-1
AUG. 2-8 9-15 16-22 23-29 30-5
SEPT. 6-12 13-19 20-26 27-3
OCT. 4-10 11-17 18-24 25-31
NOV. 1-7 8-10

This record of the conditions of temperature and rain-fall during the period of growth was obtained through the courtesy of the Secretary of the Smithsonian Institution, and proves the basis upon which the projected curves in the diagram of temperature and rain-fall have been drawn. It is proper to remark that this summer, in the District of Columbia, was unusually cold and rainy, being therefore an exceptional season. It is judged on that account to have been more favorable to the growth of the roots, though it delayed the sowing until May 17.

The growth of the plants was slow, and the first roots were lifted for examination at the close of July. The seed had been obtained from M. Vilmorin, Paris, in the early spring of the same year, and consisted of the following varieties: White Silesian, with red top; White Silesian, with green top; White Magdeburg; Castelnaudary Yellow; Beta Imperialis, (two varieties, Nos. 1 and 2;) Vilmorin's Improved White; Improved White Imperial.

The seeds were sown in the open air in the experimental farm on ground moderately manured with stable manure, and the cultivation was that pursued with the garden beet.

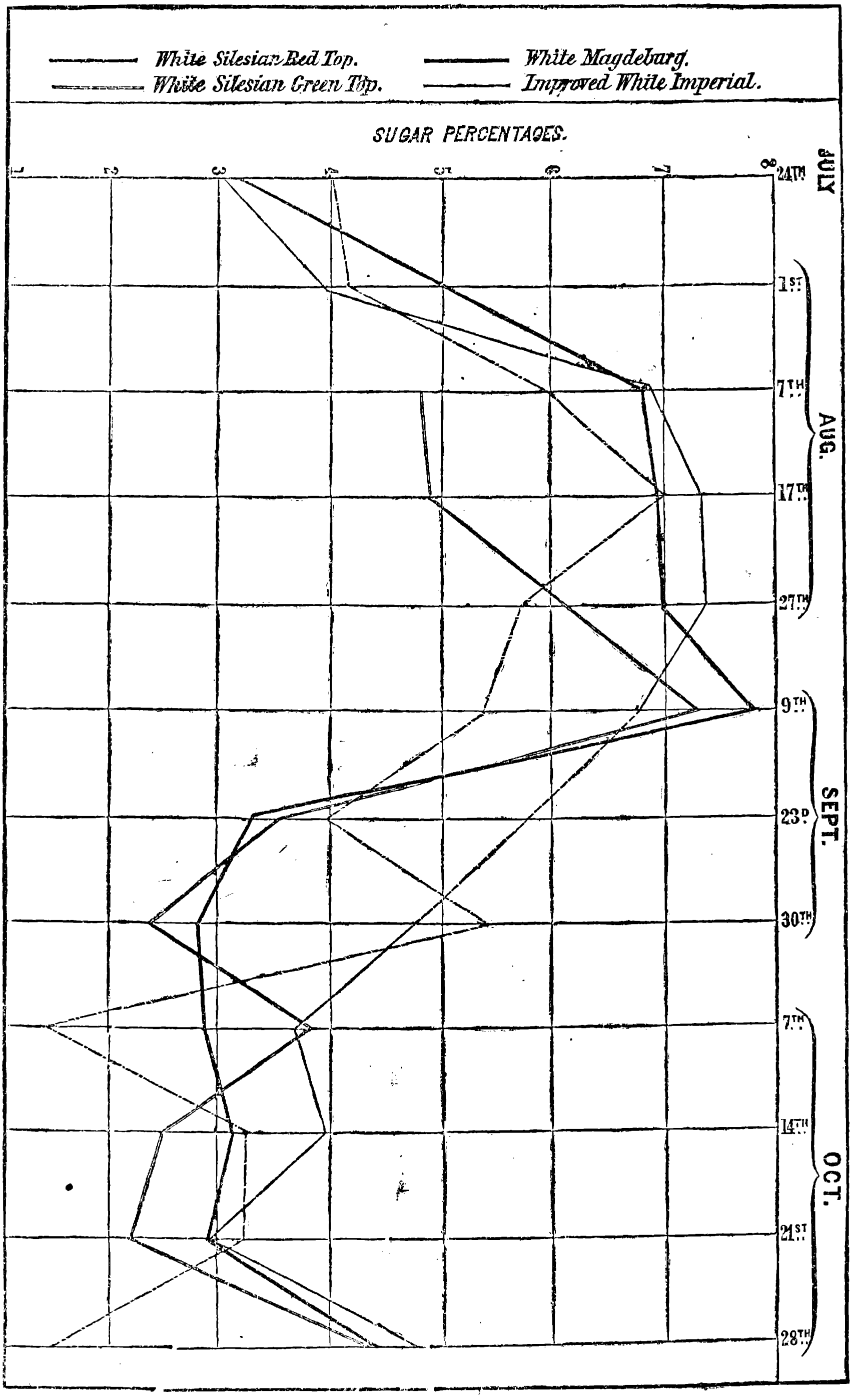
As the investigations carried on had for their object a purely practical result, no observations were made upon the early growth of the plants. The first experiments were performed when the beets had attained some size—in the third week of July, or about the 67th day of growth. From the 24th of July until the 4th of November weekly examinations were made, the results of which indicated the total growth of the plant, as well as the special increase in the percentage of sugar.

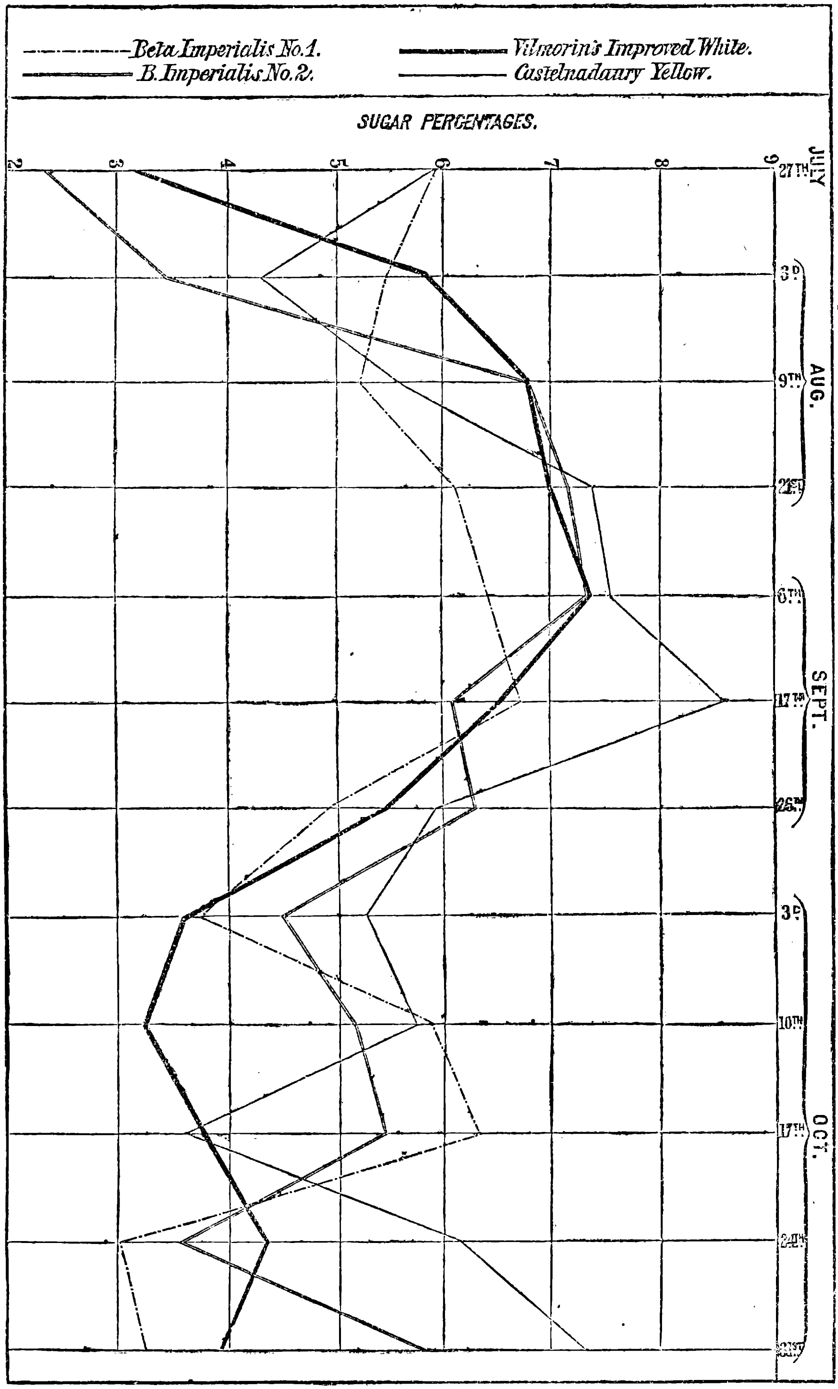
The mode of selection for examination was this: Five roots of medium size, representing a week's period of growth, were selected. The weights of these were ascertained, separating the tops close to the collar, and weighing root and top separately. The average growth depending on climate and soil was thus ascertained, as nearly as possible, and the exact relation between growth of roots and tops directly established. The roots were then pressed in bags so as to remove the juice, which was measured, its density noted, and tested for the acid and sugar present. The results obtained are given in the accompanying tables.

As might be expected, where several varieties were grown under conditions almost perfectly similar, a uniformity of result was obtained as far as the general rate and period of growth of the plant were concerned. Whatever differences were observed might with justice be referred to such variations as distinguish one variety from another. The Castelnaudary Yellow, White Magdeburg, Vilmorin's Improved White, and the Improved White Imperial are the varieties which yielded the largest amounts of sugar. The sudden falling of the sugar percentage at the close of September in all the varieties is remarkable; and as toward November, although the percentage of sugar increases, it never attains what it was in the middle of September, it is evident that there is no advantage in delaying the pressing of the roots beyond the 10th of September, and that nothing is gained by allowing the beets to remain in the ground after the 1st of October.

While the varieties experimented on conform to the general tendency to two curves of sugar maxima—an early and late—when exhibited in diagram, the differences between them are very marked; but it is difficult to state how much these differences may be owing to peculiarities of the individual variety, or to some conditions acting on the individual and not common to the whole. The curve of sugar increase follows, as a matter of course, the line of temperature, but appears to be more directly related with the curves of rain-fall, and apparently justifies the view put forward previously, that the beet will only yield large amounts of sugar when the summer rain-fall is not below that of the spring.

The diagrams on pages 40 and 41 will show the lines of sugar percentage throughout the period of examination, each page exhibiting four varieties. They are designed to afford an ocular demonstration of the figures contained in the tables, to which they correspond with the greatest possible exactness.


White Silesian Red Top.
White Silesian Green Top.
White Magdeburg.
Improved White Imperial.
SUGAR PERCENTAGES.
1
2
3
4
5
6
7
8
JULY
24TH
1ST
7TH
17TH
27TH
AUG.
9TH
23D
30TH
SEPT.
7TH
14TH
21ST
28TH
OCT.


Beta Imperialis No. 1.
B. Imperialis No. 2.
Vilmorin's Improved White.
Castelnadaury Yellow.
SUGAR PERCENTAGES.
2
3
4
5
6
7
8
9
JULY
27TH
3D
9TH
21ST
AUG.
6TH
17TH
26TH
SEPT.
3D
10TH
17TH
24TH
31ST
OCT.

During the two weeks between the 9th and 22d of August, as much rain fell (9.13 inches) as between the first of June and the first of August. An inspection of the sugar curves will show that, with one exception, the increase in the percentage of sugar was very marked. Again, between the 25th and 31st of October 4¼ inches of rain fell, and with one exception in the following week the increase of sugar in the juice marked two per cent.

An inspection of the curves of these diagrams will show within what a limited period of time the sugar exists in largest quantity. The maximum amount of sugar in the cultivation of 1867 was found between the 7th of August and the 20th of September. This is the richest period of the growth of the plant. From the 15th of October onward the rate of sugar in the juice again augments, but it never reaches the amount yielded in the close of August and 1st of September.

On reference to page 38 there will be found a diagram of the rainfall and temperature, deduced from the record immediately preceding, and a comparison may be instituted between the curves of growth and fall of rain and mean temperature, and the close relation of these three conditions may be observed.

The results of the examination of the growth of the beet and the constitution of the juice are given in the following tables:

White Silesian Red Top.

Date of experiment.	Average weight of roots.	Average weight of tops.	Per cent. of juice.	Specific gravity of juice.	Per cent. of cane-sugar in juice.	Acid, per cent.
July 24	396.5	236.7	85.90	1.025	4.005	1.14
August 1	692.2	395	89.32	1.030	4.13	1.24
August 7	1,008.2	238	88.00	1.025	5.93	1.30
August 17	982	159.2	86.26	1.024	6.97	.80
August 27	1,079.8	227	92.03	1.024	5.70	.83
September 9	1,473	208	90.79	1.026	5.30	.67
September 23	1,515	117.4	86.60	1.032	3.99	....
September 30	1,530.8	118.2	80.00	1.035	5.34	....
October 7	1,461.8	170.4	86.66	1.022	1.31	....
October 14	1,446	123	90.00	1.027	3.23	....
October 21	1,663	137	83.33	1.025	3.21	....
October 28	1,306	145	86.66	1.020	1.53	....
November 4	1,309	133	73.33	1.035	....	....

Month.	Ratio of tops to roots.	Average per cent. of sugar.	Average per cent. of juice.	Total weight.	Gain.	Loss.
July	10 : 18	4.00	85.90	639.7	....	....
August	10 : 50	5.68	88.90	1,306.8	667.1	....
September	10 : 135	4.87	85.79	1,649	342.2	....
October	10 : 90	2.66	86.66	1,451	....	198

White Silesian Green Top.

Date of experiment.	Average weight of roots.	Average weight of tops.	Per cent. of juice.	Specific gravity of juice.	Per cent. of cane-sugar in juice.	Acid, per cent.
August 1	411.8	225.8	....	....	....	....
August 7	634.6	213.6	87.77	1.038	4.75	1.20
August 17	867	152.6	84.66	1.035	4.87	1.00
August 27	1,151.8	196.6	88.68	1.029	6.10	1.008
September 9	1,440.8	362	93.61	1.028	7.20	1.006
September 23	1,536.8	181.4	90.00	1.030	3.51	.850
September 30	1,365.2	136.4	91.60	1.024	2.45	.720
October 7	1,387	146	85.00	1.030	3.76	....
October 14	1,182	172	88.50	1.024	2.50	....
October 21	1,376	143	88.50	1.027	2.19	....
October 28	1,168	149	81.66	1.040	4.30	....
November 4	1,495	135	78.50	1.039	....	....

Month.	Ratio of tops to roots.	Average per cent. of sugar.	Average per cent. of juice.	Total weight in grams.	Gain.	Loss.
August 1	10 : 19	....	....	637.6	....	....
August 31	10 : 31	4.24	87.03	1,348.4	710.8	....
September	10 : 100	4.38	91.73	1,506.6	158.2	....
October	10 : 80	3.18	85.79	1,317.0	....	189

White Magdeburg.

Date of experiment.	Average weight of roots.	Average weight of tops.	Per cent. of juice.	Specific gravity of juice.	Per cent. of cane-sugar in juice.	Acid, per cent.
July 24	492	251.2	86.72	....	3.14	1.17
August 1	572.4	322.6	84.10	1.039	5.00	1.24
August 7	908.6	300	76.51	1.043	6.70	1.43
August 17	1,121.2	360.8	84.90	1.030	6.91	.882
August 27	980.4	242.6	82.17	1.041	6.95	1.008
September 9	1,637	268.4	89.94	1.033	7.74	.758
September 23	1,230.2	207.5	91.60	1.028	3.27	....
September 30	2,068.8	138	86.60	1.026	2.77	....
October 7	1,369	142	90.00	1.025	2.87	....
October 14	1,504	122	83.33	1.026	3.16	....
October 21	1,589	170	86.66	1.029	2.96	....
October 28	1,472	142	88.50	1.030	4.32	....
November 4	1,422.4	99	76.66	1.035	....	....

Months.	Ratio of tops to roots.	Average per cent. of sugar.	Average per cent. of juice.	Total weight.	Gain.	Loss.
July	10 : 16	3.14	86.72	492.7	....	....
August	10 : 41	6.39	81.92	1,223	731	....
September	10 : 150	4.59	89.38	2,206	983	....
October	10 : 100	3.13	87.12	1,614	....	592

Improved White Imperial.

Date of experiment.	Average weight of roots.	Average weight of tops.	Per cent. of juice.	Specific gravity of juice.	Per cent. of cane-sugar in juice.	Acid, per cent.
July 24	416.7	199.7	87.11	....	3.05	1.10
August 1	442.2	305.8	86.45	1.032	3.95	0.750
August 7	729.4	272.4	80.90	1.035	6.78	0.80
August 17	1,051.8	289.8	87.92	1.026	7.30	0.820
August 27	958	240	87.06	1.036	7.34	0.90
September 9	1,377	200	83.33	1.037	6.74	0.79
September 23	....	....	....	....	....	....
September 30	1,728.5	183.6	86.60	1.030	4.75	....
October 7	1,461.4	126.8	90.00	1.026	3.65	....
October 14	1,494.8	210.4	86.66	1.028	3.95	....
October 21	1,681.4	266	88.33	1.025	2.96	....
October 28	1,426.4	107.4	83.33	1.035	4.75	....
November 4	1.537	108.4	83.33	1.030	....	....

Month.	Ratio of tops to roots.	Average per cent. of sugar.	Average per cent. of juice.	Total weight.	Gain.	Loss.
July	10 : 20	3.05	87.11	....	....	....
August	10 : 40	7.84	85.55	....	....	....
September	10 : 96	5.74	84.96	....	....	....
October	10 : 142	3.89	86.32	....	....	....

Beta Imperialis No. 1.

Date of experiment.	Average weight of roots.	Average weight of tops.	Per cent. of juice.	Specific gravity of juice.	Per cent. of cane-sugar in juice.	Acid, per cent.
July 27	292.8	159	86.59	1.030	5.93	....
August 3	393.8	209	85.24	1.030	5.50	....
August 9	670.1	191.4	87.15	1.028	5.27	....
August 21	757	136	89.74	1.028	6.12	....
September 6	1,149.6	181.4	90.55	1.029	6.40	....
September 17	934	160.4	89.28	1.033	6.70	....
September 26	1,086.4	138	86.60	1.033	4.81	....
October 3	987	120.6	90.00	1.028	3.70	....
October 10	1,082	126	83.33	1.040	5.90	....
October 17	1,286	172	85.00	1.040	6.30	....
October 24	1,300	93	88.33	1.025	3.00	....
October 31	900	84	83.33	1.027	3.20	....

Month.	Ratio of tops to roots.	Average per cent. of sugar.	Average per cent. of juice.	Total weight.	Gain.	Loss.
July	10 : 24	5.93	86.50	379	....	....
August	10 : 28	5.63	87.78	893	513.2	....
September	10 : 80	5.40	89.10	1,224	331	....
October	10 : 100½	4.6	84.99	984	....	240

Beta Imperialis No. 2.

Date of experiment.	Average weight of roots.	Average weight of tops.	Per cent. of juice.	Specific gravity of juice.	Per cent. of cane sugar.	Acid, per cent.
July 27	266	158.2	88.03	1.033	2.37	1.004
August 3	393.8	192	81.74	1.028	3.30	1.35
August 9	561.4	293.4	79.36	1.036	6.70	1.26
August 21	938.2	212.6	87.87	1.027	7.10	0.750
September 5	1,149.6	181.4	88.15	1.031	7.40	0.650
September 17	1,141.8	137.6	90.00	1.035	6.10	0.515
September 26	1,160.6	177.4	85.00	1.037	6.33	....
October 3	1,198.4	164.2	90.00	1.030	4.48	....
October 10	1,268	157	86.66	1.035	5.10	....
October 17	1,226	158	83.33	1.035	5.50	....
October 24	1,615	223	86.66	1.034	3.60	....
October 31	902	126	78.33	1.035	5.80	....

Month.	Ratio of tops to roots.	Average per cent. of sugar.	Average per cent. of juice.	Total weight.	Increase.	Decrease.
July	10 : 19	2.37	88.00	423	....	....
August	10 : 41	5.7	82.90	1,150	727	....
September	10 : 65	6.2	88.20	1,362	212	....
October	10 : 71	5.0	83.70	1,028	....	334

Vilmorin's Improved White.

Date of experiment.	Average weight of roots.	Average weight of tops.	Per cent. of juice.	Specific gravity of juice.	Per cent. of cane-sugar.	Acid, per cent
July 27	455.4	263.2	86.70	1.032	3.27	1.10
August 3	621.6	330.6	82.16	1.040	5.90	1.04
August 9	600	347.4	86.16	1.040	6.70	.850
August 21	901.2	353.6	88.83	1.032	7.00	.900
September 6	1,217.8	235.4	91.95	1.032	7.406	.897
September 17	1,267.8	257.8	88.16	1.040	6.50	.620
September 26	1,608.2	208	85.00	1.035	5.35	....
October 3	1,862.6	111.4	85.00	1.026	3.62	....
October 10	1,778	188	85.00	1.035	3.20	....
October 17	2,281	228	86.66	1.030	3.80	....
October 24	1,297.2	117	88.50	1.030	4.31	....
October 31	1,082	146	80.00	1.030	3.95	....

Month.	Ratio of tops to roots.	Average per cent. of sugar in juice.	Average per cent. of juice.	Average actual weight in grams.	Increase in period.	Decrease in period.
July	10 : 18	3.27	86.7	615	639	....
August	10 : 21.2	6.53	84.4	1,525	171	....
September	10 : 73	6.75	87.5	1,965	440	....
October	10 : 95	3.81	85.0	1,228	....	737

Castelnaudary Yellow.

Date of experiment.	Average weight of roots.	Average weight of tops.	Per cent of juice.	Specific gravity of juice.	Per cent. of cane-sugar.	Acid, per cent.
July 27	205.8	130.8	84.52	1.041	5.93	....
August 3	230.2	238	81.69	1.032	4.30	....
August 9	300	293.2	81.92	1.030	5.58	....
August 21	464.2	269.8	84.74	1.033	7.50	....
September 6	709.5	227.8	86.70	1.034	7.68	....
September 17	968.2	168.6	81.25	1.038	8.60	....
September 26	1,241.6	188	83.30	1.038	5.93	....
October 3	1,130.4	167	81.66	1.035	5.27	....
October 10	966	149	85.00	1.030	5.80	....
October 17	1,182	122	90.00	1.030	3.60	....
October 24	1,023.3	136.6	76.66	1.036	6.10	....
October 31	878	143	73.33	1.037	7.20	....

Month.	Ratio of tops to roots.	Average per cent. of sugar.	Average per cent. of juice.	Actual weight	Increase in period.	Decrease in period.
July	10 : 11	6.78	84	July 27 373	....	....
August	10 : 12 5-6	5.79	82.78	Aug. 21, (25 days,)..734	361	....
September	10 : 55¼	6.87	83.23	Sept. 17, (27 days,) 1.136	402	....
October	10 : 68 6-10	5.67	81.25	Oct. 10, (23 days,) 1.115	....	21
				Oct. 31, (21 days,) 1.021	....	94

An inspection of these tables shows some uniformity of results worthy of note.

1.—The nature of the acid of the beet.

Fresh juice exposed to the air blackens, the discoloration beginning at the surface, passing down to the bottom of the vessel, and is hastened by stirring, exposure of surface, heating unusually, and by a larger or more watery condition of the beet. This is perhaps often confounded with the action which tannic acid when present exerts upon the acid of the pulp; but juice expressed without contact of iron and kept in glass vessels also blackens, so that it depends on other causes. Dubrunfant states that when the roots are kept or dried for some time this blackening does not occur in the juice; and certainly if the acid of the juice, when freshly pressed, be neutralized with carbonate of soda, the blackening of the liquor is materially delayed. The cause of this change of color has not been sufficiently studied to enable any explanation of a satisfactory character to be offered. There are several vegetable acids present in the juice; of these, oxalic acid predominates—as shown by Pelouze and Spiller—but malic and citric acids have also been found to exist. Their presence and abundance are stated to bear a certain relation to the amount of sugar present. All of these acids, and the sugar, arise from the alteration of the same compound—cellulose—and both substances gradually diminish in amount as the root approaches the close of the first year's growth. Determinations of the amount of free acid in the juice were made during the latter part of July, the whole of August, and the early portion of September. It was anticipated that some relation might be found between the sugar and the acid elements, as it is generally supposed that the sugar is, in the progress of vegetable life, gradually converted into vegetable acid, as appears in the ripening of fruits. In these experiments, however, no certain relation could be

established, the amount of acid varying remarkably at short intervals without corresponding variation in the proportion of sugar. The acidimetry was therefore not pursued to the close.

One advantage which the beet possesses as a sugar-producing plant above the tropical cane, is the power which it has to resist alteration of the sugar in its juice by heat, when not pressed immoderately far. The experiments of E. Monnier show that after ten hours' boiling of beet juice, only one part of juice in sixty was interverted, while in cane juice it is four times as great. This he attributes to acid in the cane, stating that sometimes as much lime as $1\frac{4}{10}$ gram is needed to neutralize one kilogram of sirup. But as the beet contains acid it cannot be due to acid merely, but to acid in excess, or to its different character in the cane from that in the beet. Kepler Devignes states that acids in the cold, even though abundant, do not alter the sugar of the beet; that it is contact with heat and acid combined which causes interversion; and that to avoid this loss it is only necessary to neutralize the liquid while cold, and then to apply heat; that acids are in themselves useful in arresting fermentation, especially that of the viscous kind, and that sulphuric acid added to juice prevents viscous fermentation, and preserves the sugar from interversion in the cold juice. The most energetic acids are with him the best preservatives, defecating the liquid and precipitating in it magnesia, silica, alumina, and lime, insoluble phosphates and earthy fluorides, thus acting as a better antiseptic than lime, and only requiring afterwards either carbonic acid or milk of lime to make the liquid sufficiently clear for crystallizing. Devignes has carried the process out for three seasons in the departments of Oise and Pas de Calais, France.

2.—Amount of juice yielded.

The greatest yield of juice in the majority of the varieties was obtained within one month of the plant growth, from about the middle of August to the middle of September. Thus the maximum volume of juice at different periods in growth of the several varieties was as follows: White Silesian Red Top, August 17 to 27; Improved White Imperial, August 17 to 27; Vilmorin's Improved White, August 21 to September 6; White Silesian Green Top, September 9 to 30; Beta Imperialis, No. 1, September 17 to October 3; Beta Imperialis, No. 2, September 17 to October 3; White Magdelburg, September 23 to October 7; Castelnaudery Yellow, October 10 to 17.

Comparison of the foregoing with the periods when the percentage of sugar is greatest in the juice, shows that no parallel exists between the amount of juice and the percentage of sugar, the increase of juice being apparently due to absorption of water dependent on the rain-fall with high solar evaporation.

3.—Specific gravity of juice.

No estimate of saccharine richness of the beet can be accurately made by determining the gravity of the juice. It would appear that pecten substances dissolved in the fluid raise its gravity just as much as the presence of sugar. At certain seasons a juice of specific gravity 1.030° contains more sugar than a juice of 1.032° or 1.034°, and most generally at the close of the life of the plant the gravity of the sap augments, while its sugar may be less than one-half its maximum.

4.—Percentage of sugar.

The observations show that uniformly the sugar augments in the juice as the plant grows, up to August; rarely is any determination in July equal to those of the next two months. The percentage of sugar depends, next to the rainfall, more on temperature than perhaps any other condition. It generally reaches

its maximum about the middle of September. Yet if the temperature of August is high it may occur in that month.

We have elsewhere given the amount of sugar contained in European beets, and have remarked upon the increasing yield which has been given of late years. Whether due to the variety or to careless cultivation, whereby less alkaline salts are introduced into the growing root, and alkaline sugar-compounds formed, (which would prevent separation and crystallizing out of the sugar,) the beets grown this year for this experiment have not yielded the amount of sugar which M. Vilmorin claims they are capable of giving in France; a deficiency not wholly attributable to cultivation, and therefore perhaps owing to some conditions of climate not understood. An opinion is abroad that the beet on American soil does not yield the amount of sugar it does in Europe, and this experiment on eight varieties, in which the highest yield did not exceed 8.80 per cent. instead of 11.15 per cent., which M. Vilmorin claims they have yielded in France, lends some support to the view; but before adopting any such opinion another series of experiments under stated similar conditions should be carried out.

As far as can be ascertained of the method of determination of sugar in the juice by M. Vilmorin, it would appear to rest upon the specific gravity alone. This method is so erroneous, as is elsewhere stated, that all deductions therefrom are worthless. The experiments carried out in the laboratory show that, in order to obtain the greatest amount of sugar from the plant, it is not necessary to wait until the first year's growth is completed; this is known by the commencement of death in the leaves. It appears from the experiments that up to the 4th of November, the last date of examination, the leaves were still green, for no root was examined whose leaves, except the outer ones, were in any degree browned. The tops were by no means so succulent as they had been one or two months previously, but the beet was still alive, though evidently losing more water by evaporation than it was gaining by the imbibing power of the roots in the soil. Yet the diminution in sugar in the latter period of its life is very remarkable. In none of the varieties cultivated was the amount at the close of October equal to that in the juice of September; during September it is generally below that of August. On the 1st of November, in most of the varieties, the sugar was one-half the amount it held at the close of August; so that, judging from these results—and, being obtained from eight varieties, under circumstances nearly similar, they must be worthy of credence—the growth of the latter two months of the beet is of no value as regards its sugar, and the close of August, or thence to the 9th of September, for all practical purposes of manufacture, is the fitting time to lift the root.

Should this result be confirmed by later and more extended observations, much time will be saved to the farmer and a longer period allowed to the manufacturer for pressure, &c.

REMARKS ON EUROPEAN PROCESSES OF MANUFACTURE.

Few branches of industry, not wholly mechanical in their management, have made such wonderful advances in improvement as the manufacture of sugar from beet. Started about 60 years ago as a tentative experiment, under the forced pressure of prizes, at a time when chemistry, as a science, was in its infancy, it has never ceased to keep pace with the rapid progress of that art up to the present time, when the spectacle is presented in Europe of its driving from all but the English market all other forms of white or commercial sugar. A glance at the foregoing table of production and consumption of sugar in Europe will show clearly that, from being a doubtful enterprise, it has become one of the largest agricultural and manufacturing occupations of northern Europe. Every substance used to accomplish any benefit, every process recommended as either shortening or improving the general method, has been examined with all the skill which

combined science and practice can bring to bear; and where loss or deterioration cannot at present be prevented, it is at least thoroughly understood, which is the first step towards a remedy.

The first operation on the beet, after thoroughly washing and cleansing from outside impurities, is to remove the saccharine juice with as little loss of sugar and as little gain of vegetable or unessential saline matter as possible. The roots are first washed in rotary cylindrical washers two to three metres* long and then conducted to the rasper, which is a cylinder 60 centimetres wide, with 800 turns per minute. The fineness of the rasping is in proportion to the rapidity of the rotation. The plates of the rasp are kept free by a small stream of water. When leaving the rasp the pulp is rose-white, but discolors upon contact with the air. Allusion has been made to this blackening, which in France is thought to be due to oxidation, or to indicate an alteration in the sugar itself. To avoid it the pulp is put in sacks before pressure, the sacks separated by sheet-iron plates, and pressed so as to remove 45 per cent. of juice. This is done slowly, as the press power equals 80,000 pounds. They are pressed a second and third time, moistening the cake with water and returning it to the sacks. By this means 82 per cent. of juice is extracted, weighing from 4° to 6° B. (= 1.027 to 1.041.) This juice, containing debris of cells, albuminous matter, &c., is liable to fermentation. If this occur, the works should be stopped and the plates washed, generally with weak milk of lime.

Ordinarily, in France, when a single press is used, 100 pounds of fresh beets furnish 80 pounds of juice and 5 pounds insoluble cake, showing a loss of juice of 15 pounds. To avoid this, Bobrinsky makes use of the following method: he first dries the beet, then rasps it with a special apparatus, washing off the pulp from the rasps by a light stream of water conducted off and returned to the general steeping vessel; the pulp is placed on percolators and exhausted by washing, which may in practice be pushed until the juice flowing marks 17° Beaumé. M. Bobrinsky states that he obtains by this plan 91 per cent. of juice, 6 of insoluble cake, and a loss of 3—or a total gain over the common method of 12 per cent. of juice.

Of the various methods proposed for the extraction of the sugar from the beet, and which are practiced on any large scale, only five have been deemed worthy of adoption; these are—

1. Pressure.
2. Centrifugal force.
3. Maceration, by Schützenbach's method.
4. Maceration of fresh-sliced beet.
5. Maceration of dry-sliced beet.

The last two are only very sparingly adopted, and perhaps are only really suitable for special cases; the same may be said of Schützenbach's method; so that there are in reality only two plans in general adoption—pressure and centrifugal force. Pressure is most commonly adopted, but it never removes the whole of the sugar, the press always retaining some. This led to the process of maceration, but the latter weakens the juice and introduces too much mucilaginous matter from the root, the Schützenbach process yielding a very weak juice. On the other hand, centrifugal force never yields as pure a juice as pressure, provided too much water has not been used with the latter. A single pressure, with the addition of water, is deemed equal to the centrifugal method; double pressure, with two additions of water, is inferior to it. Maceration has shown itself defective, not in the mechanical part of the process, but in the chemical, owing to the compound nature of the juice, and therefore ranks below pressure in economical value. When a little water is added to the pulp more sugar is extracted; this water may be added to the rasped beet before it is pressed, or

* Metre = 1.09363 yards; decimetre = 3.9371 inches; centimetre = 0.3937 inch; millimetre = 0.0394 inch.

it may be added to the cake afterwards. Experience in France has shown that the former plan (before pressure) is neither desirable nor economical, as twice as much sugar is lost as by the latter method. When the beet is pressed in the ordinary method—by one pressure—very often not more than 72 per cent. of juice is extracted, 22 per cent. remaining in cake; and, as the beet contains 5 per cent. of parenchyma and 95 per cent. of juice, there is really 17 per cent. of juice retained.

Centrifugal force is very costly in its application, and necessitates too much weakening of the juice, so that, as yet, the most advantageous method proposed leaves still a loss of 12 parts of sugar, or, should more be obtained, it is of inferior quality. This is equal to a loss of 10 parts per 100 of crude sugar. With 1,000 quintals of beets daily, there is a loss equal to 100 florins* in a season; with 100,000 quintals operated on, it is, of course, 10,000 florins.

The method of maceration is carried on most promisingly by the plan of Schültze and Löffler, which consists in the use of the rasp and pressure without adding water; taking this pulp and macerating it in cold water; then a second expression of the pulp through pressure filters made of zinc plate closed above like macerators. This is asserted to be very successful in removing the sugar.

The process which has been improved by M. Schützenbach (already alluded to) recommends that the beet, instead of being rasped, be cut into rectangular prismatic forms (cosettes) about the size of the finger, placed in a tall cylindrical vessel closed at top, and exhausted by water let in above, and heated up to 88° Centigrade by a steam-coil in the bottom of the vessel. As this mode of heating was costly, and produced only a weak saccharine juice, the process has been altered so as to use dried pieces, of which a larger amount can consequently be taken; but, as defecation by lime is carried on in the same vessel with the beet, the residual mass is rendered unfit for purposes of food for cattle. These slices of beet are dried in a very coarse way, so that they are blackened and otherwise altered, and, as their impurities are pretty soluble in water, a colored juice is obtained. To avoid this M. Schützenbach has adopted the use of alcohol in lieu of water to exhaust the beet.

Schützenbach's establishment in Gallicia is probably one of the largest in Europe, consuming 50,000,000 kilograms† of beets yearly.

Perier, of Valenciennes, proposes the use of alcohol at 90° to separate the sugar from foreign matters which remain after defecation. He first defecates with the smallest amount of lime necessary, treats the juice with carbonic acid, and carries it then into a close vessel containing alcohol at 90°, which throws down the foreign vegetable matter, and the clear solution is passed into a still, where most of the alcohol is removed and the residue driven off by exposure in an open vessel. From the press, or maceration vessel, the juice is carried to the defecating machine, either by gradual slope or by *monte-jus*. Defecation renders the liquid clear and coagulates organic matter by means of lime and heat combined. The lime, saturated with organic acids, combines with albuminous, gummy, and azotized matters, decomposes salts of potassa and soda, eliminates fatty matters, casein, and coloring matters. Cellulose and organic debris are mechanically entangled in the scum, and thus easily removed; but as lime unites with sugar to form a sucrate of lime, which not only thus abstracts some sugar but also renders the juice more viscous and less easily filtered, as little lime as possible should be added. It is not easy to say what the proper proportion should be. When the plant is very young it needs more lime than when the root is older. From 4 to 10 kilograms per 1,000 litres of juice is the average required. The lime should not contain either silica or oxide of iron.

* Florin is equal to 50 cents.

†Killogram = 2.204 pounds avoirdupois; Hectogram = 0.2204 pounds avoirdupois; Decogram = 0.0220 pounds avoirdupois; Gram = 0.0022 pounds avoirdupois; Hectolitre = 2.751 bushels; Decalitre = 0.2751 bushels; Litre = 0.0275 bushels.

The defecating boilers in France usually hold 15 to 20 hectolitres—are of copper or sheet-iron, furnished with a double bottom or a steam coil, with a pressure of five atmospheres. After being heated so as to form a good steam, and then settled for 15 to 20 minutes, the liquid is drawn off and passed into the vessel which feeds the animal-black vessels.

Bernard precipitates these insoluble matters with alumina prepared from alum instead of lime. M. Jüneman remarks (Technologiste, 1867) that, as it is well known that beet-root contains no other form of sugar than that of cane sugar, the large yield in molasses obtained must be due to the destruction or interversion of it; if the treatment was in all respects proper, no glucose or viscous sugar (*mucose sucrè*) should be obtained. The first and chief cause of the formation of glucose is the preservation of the beet with so much water.

Maumene's plan of preserving the juice by addition of lime should be abandoned, as it leads to expense and to loss of sugar. Stammer's process of preserving the pulp with lime ought to be given up, as it leads to the same difficulty. The objection to the use of lime is that it dissolves in the juice and unites to form a definite chemical compound with the sugar which is retained from the resulting produce, unless specially recovered. This objection might be gotten over by the use of carbonic acid, as of late adoption, but when milk of lime is used it sets free soda and potash in a caustic form, by separating these bases from the acids they were previously combined with. Thus the juice is never neutral, and ammonia is formed in it by the action of these alkalies upon the protein bodies, and this leads to the direct formation of glucose. These alkaline salts, not separated by the bone charcoal, also form the mannite (mucose sucrè) by the fermentation caused by their presence, and thus we have the existence of molasses and viscous sugar accounted for. To avoid this, Jüneman proposed to bury the fresh beet in dry lime, and when defecation is going on, after the milk of lime is added, to treat the juice with one-quarter to one-half pound of stearic acid, and heat to boiling; then to remove the soap foam formed, and add 2½ per cent. of wood charcoal, previously prepared by boiling 90 parts of charcoal in large grains in a solution of five parts of acid phosphate of lime and five parts of sulphate of alumina; drying and igniting to remove the acids and water. He believed this to be an improved bone-black. The sugar liquid and the prepared charcoal are boiled together for half an hour, and filtered through more of this charcoal. The juice is now pure, and will crystallize well, preserve its neutrality and keep unaltered; may be treated by boiling in the ordinary way, and run into the crystallizers, where it forms in 10 hours, and 60 to 70 per cent. of crystallized sugar may be obtained in this manner. The colored sirup drawn off from the crystals may be treated again in the same way, another quantity of crystals obtained, and so on to even a fourth time.

Whenever chemical skill can precipitate the whole or the greater part of the sugar from the fresh juice in such a form as to be easily separated from the precipitating agent, a great step in the manufacture of sugar will have been gained. Much attention has already been devoted to this object. It has long been known that the alkaline salts have a great tendency to unite with sugar, but it is difficult, and, indeed, often impossible, to separate these substances afterwards by acids; and Kühlmann has shown that even the strong mineral acids, sulphate of magnesia, or sulphate or muriate of ammonia, do not affect it. Caustic baryta has been used by Dubrunfaut and De Massy to precipitate the compound of sugar-baryta, which is decomposable by carbonic acid, but not even a boiling temperature precipitates the whole sugar. Acetate of lead has been of late used; but however efficient the salts of lead may be, the fact of their being active poisons will always lessen their value and use, and lead to the pursuit and adoption of other means for the separation of sugar by precipitation out of the juice.

M. Jüneman states that he has found a substance cheap in market which unites with sugar and precipitates it from the juice. If he has found such a substance he has preserved it a secret.

The decoloration is judged good when the scum is firm, of a greenish-white color, and dry. It should detach readily from the edge of the boiler, and when cut give an ammoniacal odor. The juice should be limpid, and of a clear amber color; if these qualities do not exist defecation has been imperfect, and the quantity of lime will need to be augmented or diminished according to experience and special trial. As this dosage of lime is always uncertain in quantity and delicate of determination, Rousseau, adopting an idea long ago put forth by Kühlmann, thought of employing a large excess of lime and precipitating the surplus with carbonic acid. He added five or six times as much lime as at the previous operation, or about 25 kilograms per 1,000 litres of juice, stopped steaming at 95° C., and filtered through a drugget cloth covered with animal-black 25 centimetres thick; the juice is thus nearly decolorized, and is passed into basins of sheet iron furnished with two steam coils, one for steam and the other for carbonic acid. As soon as the latter passes through the liquid it renders it turbid, it ceases to be viscous, and the white foam on the surface disappears when this part of the process is completed. The liquid is now boiled to drive off excess of carbonic acid, which would otherwise retain a little carbonate of lime dissolved; then decanted and filtered.

The carbonic acid is obtained from burning charcoal or coke, and purified by driving the vapor of combustion through water before entering the defecating boiler.

The process of MM. Porsoz and Perier has been lately tried in France with success. Like the Rousseau process, an excess of lime is employed; heat is applied to near boiling, and the juice passed on to the receiving vessel, where it meets carbonic acid; when the juice is saturated by it, it is boiled and transferred to the decanting vessels, where it is again treated with lime and carbonic acid, decanted and filtered. The juice is now very clear and almost colorless.

As carbonic acid never wholly precipitates lime from solution, but keeps a small amount in solution as carbonate, M. Wray proposed to use solution of nutgalls to remove the carbonate thus dissolved.

M. Garcia used for the same purpose weak fatty acids, such as solution of Marseilles soap, which does not contain common salt. This process gives good results when the juice or sirup is much altered and difficult to manage otherwise. These new methods of defecation have driven out almost entirely the old processes in which blood or milk is used.

The juice is now fit for the animal-black filters; but when the Rousseau or Persoz and Perier process is used, the filtration through black is reduced to a minimum.

As the use of lime in the way described is to some extent injurious to the juice, Badant Gilain, in a Belgian patent of 1863, describes the use of sucrate of lime, (or lime previously boiled with sugar,) instead of the direct use of the lime.

The hectolitre of sirup at 25° Beaumé (=1.197 specific gravity) without molasses is treated with 1 to 5 kilograms of caustic lime, freshly made and firm in grain, and well mixed in. After a short rest the liquid is decanted and used for saturating other juices.

Nugent and Deminal, manufacturers at Lille, also used the sucrate of lime, either alone or mixed, with a little lime in the defecating vessel. Where the beets are difficult to work, these reagents are placed in the saturating boiler rather than in the defecating vessel.

When the sirup juice reaches 25° it is forwarded to the animal-black filters, if not already filtered, and then passed on to the reservoir for granulation, which is carried on in open pans or under a vacuum. The latter method does not yield a sugar of good appearance according to these operators.

From the charcoal filters the juice passes to the evaporators, which are generally open to air above, about two metres wide and eight-tenths of a metre

deep, heated by a voluminous steam-coil, which keeps the temperature about 103° or 104° C.

To remove the vapors a dome is employed opening into a chimney. When the juice is concentrated to 25° the steam is shut off and carried on to a montejus.

Open-air evaporation has disadvantages in browning the liquid and diminishing the product somewhat by interversion of the sugar, on which account vacuum pans have been used by some French manufacturers of late. M. Cail & Company use a triple vacuum-pan arrangement of a special form, which produces a marked economy of fuel, by passing the waste heat of one pan into another; each pan being about 10° hotter than the preceding, and the greatest heat being 90° C. As the use of animal-black leads to some loss in sugar, M. Perrets, of Roge, (Saone,) France proposes to omit it from the process altogether, using instead excess of lime, and precipitating the surplus with carbonic acid, and carefully decanting the juice.

During the rasping, alteration is prevented by milk of lime, so weak as to be almost colorless, with which the raspers are washed. During defecation the juice is raised from 50° to 75° C., and the hydrate of lime added in proportion of 500-3000 grams per hectolitre of juice of 1.040 specific gravity, varying the proportion according to culture and maturity of the beet, the plan being, first, to use the most lime possible; second, to have as clear a juice as can be; and third, obtaining a firm scum, and carrying the temperature as close to 90° C. as possible. From the defecating boiler the juice is carried to the saturating pan; the defecation is carried out by the Rousseau plan already described. Another method described for replacing animal-black in clarification is by the use of wood-ashes, cinders—that is, leached ashes—which are placed in the filters usually occupied by the bone-black.

REMARKS ON THE CHEMICAL COMPOSITION OF THE BEET.

In order to render this report more complete, a succinct view of the present state of chemical knowledge of the sugar beet is here subjoined. Since the analyses of Payen and others some years back, which were not exhaustive, the beet has been examined by two very competent chemists, Messrs. Corenwinder and R. Hoffman, the former working on beets grown at his own establishment, near Lille, (Belgium,) the latter upon beets from the vicinity of Prague, in Bohemia. The experiments of Corenwinder are of interest, in showing that the effect of artificial manures containing ammonia, or of guano, is to diminish the amount of sugar, relatively and absolutely, by increasing the amount of albuminous matter and of the mineral salts.

Corenwinder's analyses of beets.

Description.	Water.	Sugar.	Albumen and cellulose.	Mineral matter.
1. Beets raised without manure at Quesnoy	85.85	10.9	3.644	0.716
2. Beets raised with Flemish manure	85.30	9.75	4.167	0.803
3. Beets raised with fresh dung	85.65	9.50	1,091	0.729
4. Beets raised with guano	86.00	8.80	4.552	0.668
5. Tops of No. 3	86.76	6.60	5.773	0.867
6. Beets raised in the marshes of St. Omer, manured with mud	88.74	6.82	3.418	0.972
7. Beets raised below the dikes of Dunkirk, not manured	87.70	7.15	4.512	1.078
8. Beets raised near Lille, with great quantity of Flemish manure.	89.72	5.22	4.209	0.871
9. Beets from Nerves, manured with fresh liquid dung	84.92	11.00	3.510	0.770
10. Beets from D'aisne, raised in stable dung and Flemish manure.	78.50	13.75	6.550	1.300

Corenwinder's analyses of the ash of sugar beet.

Description.	Carbonate of potash.	Carbonate of soda.	Sulphate of potash.	Chloride of potassium.	Chloride of sodium.	Phosphate of soda and loss.	Insoluble matter.*
1. Beets without manure......	33. 362	20. 499	4. 903	10. 301	....	4. 229	26. 066
2. Beets in Flemish manure...	27. 832	22. 745	5. 160	15. 522	....	4. 614	24. 127
3. Beets in fresh dung.........	25. 618	26. 268	6. 923	11. 309	....	4. 543	25. 339
4. Beets in guano.............	31. 241	19. 756	6. 917	8. 103	....	4. 551	29. 439
5. Beats of No. 3.............	6. 126	30. 632	10. 813	9. 009	....	1. 920	41. 440
6. Beets from soil manured with mud.............	....	34. 456	4. 767	33. 877	7. 492	4. 172	15. 236
7. Beets not manured.........	7. 714	39. 644	3. 760	30. 971	....	3. 843	14. 058
8. Beets with Flemish manure.	18. 399	30. 299	4. 468	20. 807	....	3. 313	14. 068
9. Beets with liquid dung......	54. 423	4. 031	4. 084	14. 491	....	0. 747	22. 239
10. Beets with stable dung and Flemish manure...........	44. 999	5. 562	6. 037	18. 145	....	0. 585	24. 672

* The insoluble matters consist of phosphate of lime, phosphate of magnesia, carbonate of lime, silica, iron, &c.

These analyses of the ash of the roots show how large an amount of alkaline salts is stored up in the refuse cakes, for although much of this mineral matter is removed with the juice, still a large portion remains in the marc. Almost the whole of the soluble portion of the ash is composed of salts of potash and soda, while the insoluble portion consist chiefly of phosphate and carbonate of lime and magnesia. Corenwinder's examination of the mineral matter of the tops shows, that while the percentage remains the same as in the root, yet that the deficiency of potash is remarkable, its place in the top being supplied partly by soda, but mostly by lime and magnesia. In looking over these analyses one cannot but remark the different proportions of saline ingredients in different beets, grown in different localities and subject to different cultivation; it shows to what an extent this variety of chemical composition may go without altering the specific character of the plant.

These experiments also show what variety in the amounts of sugar may exist in plants grown in different localities, even where the treatment by manure may be the same.

In these cases the causes of difference may be set down as due to either climate or soil of different localities. Corenwinder, without any direct examination of the point, attributes the difference in sugar product wholly to the soil; but this may very fairly be doubted. What is not due to difference in variety, which no doubt is the chief cause, may to a great extent be due to the climate of the locality. A moist ground will always convey more nutriment of the mineral class to the roots than a dry soil, even when the composition is the same.

The experiments of R. Hoffmann constitute perhaps the most complete series of analyses which have been made up to the present time. He determined at three periods in the growth of the plant the relative amount of water, dry matters, and ash, the nitrogenous matter, cellulose, sugar, and absolute weight of leaves and roots.

Hoffmann's analyses have filled a want much felt in the chemical history of the growth of the beet, and have placed us above the necessity of referring to the meagre analyses of Boussingault and Payen—good in their day, and the only information hitherto attainable.

The following are the chief results of Hoffmann's examinations:

A.—*Growth of the beet; weight of roots and leaves.*

	June 30.	August 31.	October 30.
Ratio of leaves to roots	1.96 : 1	0.49 : 1	0.93 : 1
Average weight of leaves	99.8	248	750
Average weight of roots	50.8	504	802
	150.6	752	1,552

The result here given for June and August will justify comparison with the results obtained in this laboratory, where an equal increase of root to ten times its weight during three months of summer shows how necessary summer rains are to secure this growth in a given time.

The result of October 30 is not in accordance with that obtained here. At this period the tops in this latitude are not in that vigorous condition which the root is, and hence the ratio is vastly less than that given by Hoffmann.

B.—*Relative amount of water and dry matters.*

	June 30.	August 31.	October 30.
Tops, water	88.55	87.12	87.60
dry matters	11.50	12.09	13.00
	100.00	99.21	100.60
Roots, water	89.20	83.20	75.20
dry matters	10.80	16.80	24.80
	100.00	100.00	100.00

The effect of season in augmenting the dry matters is evident in both tops and roots; remarkably so in the latter, so that by November 1 the dry matters had increased to 2½ times the amount at 30th June, while that of the water present had diminished by one-seventh.

The increase of solid matter cannot be wholly set down to sugar, as Hoffmann's results would show; for our experiments prove that the percentage of sugar diminishes with the autumnal growth of the plant, while the gravity of the juice remains the same. The increase is chiefly cellulose, pecten and albuminous matters.

C.—*Composition of the root at same period.*

	June 30.	August 30.	October 30.
Water	80.20	83.20	75.20
Ash	0.66	0.90	1.30
Nitrogenous organic matter	1.00	1.64	2.20
Cellulose	1.01	1.50	2.07
Sugar	4.00	9.42	15.00
Non-azotized organic matter, pecten, coloring, and fat	4.13	3.34	4.23
	100.00	100.00	100.00

One hundred parts of dry root consist of—

	June 30.	August 31.	October 30.
Ash	6.12	5.36	5.24
Nitrogenous matter	9.26	9.76	8.87
Cellulose	9.35	8.92	8.35
Sugar	37.03	55.95	60.48
Non-nitrogenous organic matter	38.24	20.01	17.06

The result of these tables is to show the increase of sugar up to November 1, a result wholly at variance with that derived from our experiments, in all of which varieties there was, as before stated, a remarkable diminution of sugar after the middle of September. If these discordant results on two continents are not due to differences in variety of plant as regards late maturity, or to climate, further experiments will be needed.

100 parts of ash (deduction made for carbonic acid and sand) yield:

	Root.	Leaves.
Potash	50.895	24.134
Soda	5.765	13.011
Magnesia	6.742	18.316
Lime	9.835	17.796
Oxide of iron—oxide of manganese	1.127	2.301
Silica	3.422	5.110
Phosphoric acid	16.265	6.932
Sulphuric acid	4.017	7.361
Chlorine	1.929	5.009
	100.	100.

It may be well to place by the side of these recent analyses the older one of the ashes of red beet, by Etti, and the English analyses of Way and Ogston:

Potassa	19.515
Soda	21.119
Peroxide of iron	0.095
Lime	3.250
Magnesia	6.960
Chloride of Sodium	2.355
Acid, sulphuric	2.465
Acid, phosphoric	2.395
Silicate of iron and sand	14.116
Carbon	4.223
Carbonic acid	29.103

Analyses of Way and Ogston.

	Yellow Globe—		Long Red—	
	Bulb.	Leaf.	Bulb.	Leaf.
Potassa	23.51	8.34	29.05	27.53
Soda	19.08	12.21	19.05	5.83
Lime	1.78	8.72	2.17	9.06
Magnesia	1.75	9.84	2.79	9.10
Oxide of iron	0.74	1.46	0.56	4.48
Carbonic acid	18.14	6.92	21.61	6.11
Phosphoric acid	4.49	5.89	3.11	4.39
Sulphuric acid	3.68	6.54	3.33	6.26
Chloride of sodium	25.54	37.66	14.18	29.85
Silica	2.22	2.35	4.11	1.35
	99.96	99.93	99.94	99.96

The same analysts calculate that one ton of beets removes from the soil:

Mean of three specimens in pounds.	Bulb.	Leaf.
Potassa	4.99	7.86
Soda	3.02	2.52
Lime	0.41	3.31
Magnesia	0.43	3.27
Oxide of iron	0.12	0.52
Phosphoric acid	0.66	1.94
Sulphuric acid	0.65	2.20
Chloride of sodium	5.29	12.82
Silica	0.54	0.76
	16.11	35.20

By comparing these figures with the analyses of the ash by Corenwinder given previously, it will be found that the ratio of potash to soda in the root is precisely the same in both specimens, although raised in different countries; also that the residues of the press are highly valuable for their alkaline constituents.

The result of all Mr. Hoffmann's experiments shows that the water in the leaves diminishes as they grow; the mineral elements also diminish. During the growth of the root the water also decreases. The cellulose and mineral matters do not increase except in the dry specimen.

With regard to the amount of azotized matter present nothing definite can be stated. The sugar gradually increases as the root develops; the pecten disappears and the sugar is produced at the expense of it.

Hoffmann's analyses of the second year's growth of the beets are not given here, as the saccharine relation terminates at the close of the first year. His results show that in the last year of the plant's life it gradually loses its sugar until it finally disappears a little before seeding.

I cannot conclude this account of the series of experiments carried out this year without acknowledging the valuable services of Dr. W. C. Tilden, assistant chemist, who has shown himself at all times zealous and capable in carrying out the details of the chemical examinations.

In order to make the laboratory a more efficient aid to the Department it is desirable that it should not be confined in its operations to the execution of analysis alone.

The relations of geology to agriculture, though not so close as those of chemistry, are yet sufficiently so to call for some attention to them, and to insure benefit to agriculture in its widest sense. Meteorology, chemistry, and geology are the three sciences which, next to botany, shed the greatest light on practical agriculture. Geology has been but lately cultivated in this direction, and in the hope of fostering the connection it is desirable that the Department should establish, in conjunction with the laboratory, a collection of geological specimens which would illustrate the agricultural and economic geology of the United States. Whatever relations of soils to their parent rocks exist would thus be brought out in a prominent and systematic manner, and as ample room can be afforded in the new building for the chemical division, it would be desirable to establish it on the removal from the Patent Office.

This subject, having already been brought under your notice, demands no further argument.

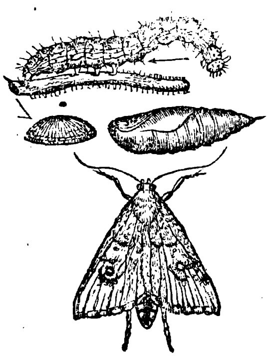
THOMAS ANTISELL, M. D., *Chemist.*

HON. HORACE CAPRON, *Commissioner.*

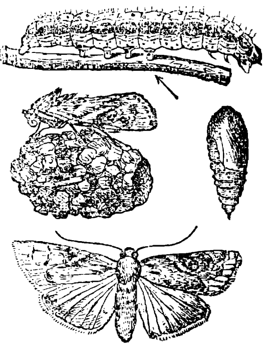
REPORT OF THE ENTOMOLOGIST.

SIR: As full descriptions of the habits and natural history of the various insects injurious to our crops have been given in former reports, together with the most approved methods generally in use for their destruction, the present paper will be confined to those insects principally which have been the most numerous and injurious during the past year, or which hitherto have escaped observation.

The caterpillar, or cotton army worm, (*Anomis xylinæ,*) appeared last season in countless myriads, destroying millions of dollars' worth of cotton, and in many instances totally ruining the planters who relied upon cotton alone as their main crop. It is also to be feared, if effectual means are not soon devised for their extermination, that the planting of cotton must be abandoned for a time, at least in the most southern States, where these insects particularly abound, and most probably originate. As many planters have not seen our former reports on this subject, it may interest them to give a condensed description of the habits and transformations of this insect, so that they may be able to recognize it when it comes, and at the same time, perhaps, among themselves, devise some practical method of destroying it on its first appearance in the cotton field. In the more northern cotton States the cotton army worm is only an occasional visitor, becoming rare as it approaches the north. In the extreme south they appear every season in greater or less numbers. As heavy frosts kill caterpillar, chrysalis, and perfect moth, its periodical appearance in certain districts is most probably owing to climatic influences, the insect being exterminated for the time whenever there has been extreme cold weather, and not appearing in that neighborhood again until replaced by fresh migrations of moths from more southern localities, where the frost had not reached. An old cotton planter in South Carolina states that the moth made its appearance periodically every 21 years in his district, having been very destructive in the years 1804, 1825, and 1846. "Moreover, it had actually been foretold that in the year 1867 the caterpillars might be expected to destroy the crops." This was certainly a very strange coincidence, but proves nothing, as, unlike the 17 years' locust, whose whole 17 years of disappearance is said to be spent under ground, and whose habits and natural history we are therefore unable to trace, I have bred the cotton fly or moth from the egg up to the perfect insect, and the whole of its transformations do not occupy a period of more than a few weeks in the summer or autumn.



As false alarms about the appearance of the cotton worm in certain districts are frequently inserted in the southern newspapers by persons interested in the sale of cotton when the worms seen in the field are merely boll worms, grass worms, or some other comparatively harmless caterpillar, I will mention some distinguishing marks by which the cotton moth may be recognized in either the egg, caterpillar, chrysalis, or perfect state. In the first place, the egg of the cotton worm is round and very much flattened in form, and of a green color, whereas the egg of the boll worm moth is round, somewhat bluntish, conical in shape, and of a yellow color. The egg of the cotton worm is mostly deposited on the leaf or branches, while the egg of the boll worm is usually placed in the so-called "ruffle" or envelope of the flower.



The caterpillar of the cotton worm has six pectoral or front feet, two anal, and eight ventral, the two foremost of the ventral feet being *very small, apparently useless*, and not employed for grasping, like the other six; while in the grass worm the legs are all perfectly formed and used when creeping from leaf to leaf. Owing to this imperfection in the formation in the first pair of ventral feet, the cotton caterpillar always moves like the span worm or looper, that is, by alternately contracting and expanding its body, holding fast by means of its hind feet to the object on which it rests, while the head and fore feet are extended as far as possible, the stalk or leaf being securely grasped by the pectoral feet, the hinder part and legs are suddenly brought up to them, so that at every step the body assumes the shape of an arch; whereas the grass worm glides along by moving its feet alternately and gradually without raising the middle of its body from the leaf. The cotton worm has also a habit of doubling itself up suddenly when disturbed, and springing to a distance, but the grass worm merely rolls itself up somewhat like a snake when coiled. The cotton worm, when about to change, spins a very loose web or cocoon among or in the leaves or branches of the cotton plant or weeds infesting the field, at some distance from the ground. The grass worm, on the contrary, comes down from the plant it has fed on and retires under stones, loose earth, or buries itself in the ground before forming its cocoon. The perfect moth of the real cotton worm is much more angular and graceful in form, with the upper wings of a somewhat reddish or claret colored brown, and there is always a darker spot having a light centre, more or less defined in the middle of these wings, while the under wings are of a dark ash color. The grass worm moth is much more clumsy in form, its upper wings being clouded and barred with dark and light grayish brown, while the under wings are lighter colored.

Whether the cotton caterpillar feeds upon any other plants or not I am unable to say, never having found it eating anything but cotton, and even when seen on weeds in cotton fields the worm has merely wandered away to find some suitable locality in which to spin its cocoon. Several cotton worms, kept for the purpose of experiment, constantly refused to eat anything but cotton, although supplied daily with fresh leaves of all the weeds or plants in the neighborhood, and several actually starved to death rather than touch anything but cotton as a food.

The caterpillars appear more or less, almost every season, in some of the more southern Florida plantations, sometimes in a very sudden and unaccountable manner. Mr. E. Richards, of Cedar Keys, wrote a very interesting letter some years ago to the Department, which appeared to prove that the moth is exceedingly migratory in its habits and capable of flying great distances; as in many places where they have suddenly appeared in great numbers there has been no method of accounting for their presence excepting that the worms had previously subsisted on some other wild plant or weed, and left their original food for the cotton, which was more nutritious or congenial to their taste, or that the moth had migrated from a great distance. Mr. Richards, in his letter, says:

> The last of July, 1845, these caterpillars made their appearance in a small field of three or four acres of sea-island cotton planted on Way Key, an experiment to see if cotton could not be advantageously cultivated on the keys, no other cotton having been previously planted within 80 miles of them, but the whole crop was destroyed. The caterpillars at the same time were destroying the cotton in the interior of the country.

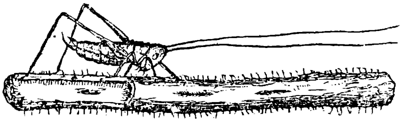
As far as the habits of the cotton caterpillars are known, whenever they have appeared in Georgia or South Carolina they almost invariably came from

the southward, and committed great ravages some 20 or 30 miles off, a fortnight or three weeks before making their appearance in the localities named. The second and third broods of moths still travelling further north, spread destruction and devastation wherever they deposited their eggs, until providentially killed by the frost. If this theory of their northward migration is correct, it would be well for the planters to give a small reward to the discoverer of the first cotton caterpillars in their neighborhood, and then combine to turn their hands *en masse* on the infested plantation, to crush, burn, and destroy the insect in all its forms, as worm, chrysalis in cocoon, or fly, even if they have to burn the field to get rid of them, and to pay the proprietor for the damage done; for they may rest assured that if allowed to become moths, and multiply without any effort being made to destroy them, the flies will undoubtedly migrate to all the neighboring plantations, and their own crops will eventually be destroyed among the rest. Many remedies have been proposed for their extermination. Fires built at twilight in and near cotton fields would doubtless burn up a great many moths, yet it is very questionable if these fires will not also attract moths from other plantations, which escaping the fire will found new colonies, when they otherwise might have been content to remain where they were as long as there was any cotton foliage left for their progeny to devour. Large shallow plates or dishes filled with molasses or sirup with vinegar, or some strong aromatic substance, have been used in dry weather on a small scale with success, especially when the moth makes its first appearance, as, being attracted by the sweet scent, they crowd into the plate and are drowned. Perhaps if a preparation of arsenic or some tasteless poison were mixed with the sirup it would answer better, as doubtless most of the moths visiting the plate, after satisfying their appetite, escape being caught by the viscid substance and fly off to the neighboring plants. Hard wood boards or shingles thickly coated on one side with the poisoned preparation might be used as a substitute for the plates, but in this case the boards should either be placed under temporary shelter, or in a slanting position with the prepared side underneath, so that heavy rains could not wash off the poisoned mixture. Sirup and rum painted or smeared on the trunks of trees are extensively used by continental entomologists to attract the night-flying moths.

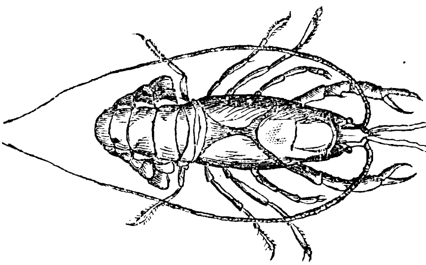
If poison, however, in any shape is used for exterminating noxious insects, the hands working on the plantation should be warned of it, otherwise many of the young negroes might mysteriously disappear with the moths, and it should on no account whatever be used where there are bee-hives in the neighborhood. This poisoning process has nevertheless been found to answer very well in Maryland and Virginia, where tobacco is the staple crop. The sweetened poison being dropped into the flower of the Jamestown weed (*Stramonium*) or the tobacco blossoms themselves after having been cut from the plant, the moth is attracted by the flower and perfume in the early twilight, inserts its large flexible trunk, and after imbibing the poison dies before having time to deposit its eggs. I first proposed this plan in a paper read before the United States Agricultural Society, 12 or 14 years ago, and it has been practiced with decided success in Florida by the planters of tobacco. A machine on wheels for ejecting vapor or steam of certain ingredients on the plants infested by the caterpillar, has been mentioned by some of our correspondents as killing the insects without injuring the plants, but not having had either reliable or ocular demonstration of its utility it is merely referred to without comment, excepting that on an extended scale the plan appears impracticable, as the machine itself would injure the plants, and anything that would kill the caterpillars at once would probably also kill or scorch the foliage.

The eggs of the cotton moth are frequently destroyed by several species of small ants, which are said to bite the egg open when just deposited and to abstract the substance. Many caterpillars, especially if weak or somewhat disabled, fall victims to the voracity of the restless myriads of ants always abound

ing in the fields, and feeding upon the honey dew secreted by the cotton louse or aphis, and the bodies of such other insects as they can overcome. The cotton caterpillar is also destroyed by a small yellow and black banded ichneumon fly, which deposits its eggs in the worm. This egg hatching produces a footless grub, which feeds in the body of the caterpillar, at first avoiding all the vital parts and devouring merely the fatty matter, leaving the larva with strength to spin its cocoon and change into the chrysalis, with its internal foe still in its body. The grub then, after devouring the remainder of the interior, changes into a pupa and finally emerges from the dried chrysalis' skin as a full-formed four-winged fly, somewhat resembling a very diminutive wasp.



Mr. S. S. French, of Greenville, Mississippi, and other planters, have forwarded to the Department stalks of cotton injured by a "large green grasshopper" which last year made its appearance on their plantations for the first time, and injured the cotton plants by piercing the stalk, and depositing its eggs in the pith. This insect has not hitherto been noticed on the cotton, and is not mentioned in any work on cotton or cotton insects. The injured stalks sent were preserved all winter, and the eggs hatched out in June and July. The insect appears to be a species of grasshopper, (probably *Orchilimum,*) but is yet much too young and undeveloped to show to what particular species it belongs. These stalks are injured much in the same manner as those of fruit and forest trees when pierced by the 17-year locust, excepting that merely two long, grayish eggs are deposited in each fissure or hole in the stalk. It was not stated in the letter whether the full-grown insects injured the foliage of the cotton or not, but the young, which are now in confinement, feed greedily upon flowers or leaves of common red clover. They, indeed, are so voracious as to eat the eggs of their own species, when exposed by splitting the stalk, and their younger relations when first hatched and too feeble to get out of the way.

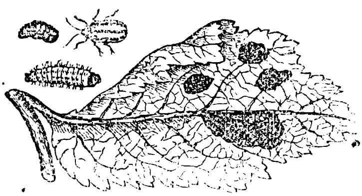


While on the subject of cotton and its enemies, although not strictly belonging to an entomological report, it might be as well to mention that when I was in Eastern Mississippi, some years ago, much complaint was made by the planters about the fresh water crawfish destroying their young cotton by nipping off the plants below the seed leaves, and then carrying them into their holes to eat. The following interesting communication on this subject has been received by the department from Mr. N. B. Jones, of Oak Grove, Mississippi:

Since the year 1833 I have known and closely observed the innovations of this little depredator. My first acquaintance with it was in the above-named year, in Lowndes county, Alabama, where great havoc was committed by it in the post oak prairie lands. Its mode of living resembles that of the crab, subsisting mostly upon putrid animal matter, worms, insects, &c. In the mulatto clay and sandy soils, crawfish inhabit creeks, branches, bogs, and marshy places. In such soils they seldom, if ever, injure or trouble vegetation. It is in the lime lands of Alabama and Mississippi, a belt of country extending from Houston, Mississippi, beyond Montgomery, Alabama, from 60 to 80 miles wide, the soil being black and grainy, in many places resembling coffee grounds. Underneath the whole of this belt lies a soft, grayish rock, in some places exposed to the surface, while in other places it is over 30 feet to it. It is in this belt of rotten limestone country (so called) that the crawfish is so destructive to corn and cotton, from the time it appears above ground until the plant grows beyond their reach, or the stalk becomes too hard for their pincers. This only happens where the springs are more rainy and water more abundant than usual, and some localities are injured 10 to 20 fold more than others on the same section of land. These crawfish burrow down six or eight feet, piling the mud six or eight inches high around their holes, which all contain water long after the rains have ceased to fall. Many thousands were

killed by torchlight with sticks, on damp, drizzly nights, near the Alabama river, from which much benefit to crops resulted.

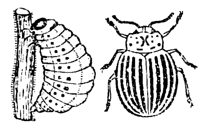
Should these crawfish increase so as to become a great nuisance to the planters, they might readily be exterminated by dropping small pieces of semi-putrid flesh or fish, with strychnine, into their holes, where poultry or domestic animals could not reach.

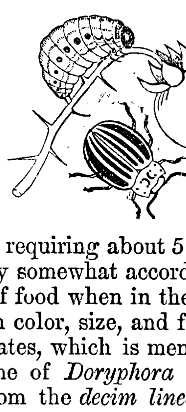


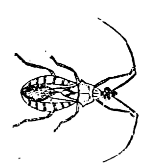
Many complaints have been made about the elms in cities being destroyed by a small worm, where the trees have been planted in the streets for shade and ornament and have attained a considerable size. I will here give a condensed history of the beetle and its habits: This insect is generally known as the elm-tree beetle, (*Galeruca calmariensis,*) and is a small, striped beetle, somewhat resembling the three-lined leaf or striped cucumber beetle, but much smaller, and of a dull, yellowish-gray color, with only one dark line and spot on each wing case. This insect deposits its eggs in clusters upon the leaves, the worms or larvæ from which are hatched out in a few days, and immediately commence to feed upon the parenchyma or soft pulpy substance of the leaf, at first making merely small blotches, but eventually, as they increase in size, destroying the whole leaf, leaving only the harder part, such as the mid-ribs and network of veins, untouched, thus causing the leaves to turn brown and wither, until the whole tree assumes the appearance of having been scorched by fire. These worms, when fully grown and ready to change into pupæ, not being able to descend by means of a silken thread, like the real caterpillars, crawl down the trunk to the ground, and, soon casting their larva skin, change into pupæ on or near the surface of the earth, at the foot of the tree they have despoiled. Some of the worms, however, conceal themselves in fissures of the bark, where they undergo their transformation into the perfect beetle. These last, however, are few, and bear no comparison with the multitudes of pupæ which will be found on the damp ground, motionless, helpless, and appearing like grains of wheat accidentally fallen near the tree. After becoming pupæ, in a few days the skin of the back splits open, and the perfect insect crawls forth, furnished with wings, by means of which it is enabled to fly to other trees and deposit its eggs, thus spreading the nuisance to every elm in the neighborhood; or it may ascend the same tree and lay the eggs for a second generation, which destroys the second crop of leaves, frequently so enfeebling the already exhausted tree that it is unable to recover, and eventually perishes. If the trees are examined daily when the worms first appear on the foliage, which may be known by the leaves exhibiting a somewhat blotched appearance, it will be found that in the course of two or three weeks multitudes of worms have left the leaves, and are slowly descending the trunk for the purpose of undergoing their final transformation on the earth, under stones or moss, near the collar of the tree, and in two or three days the pupæ may be killed by crushing under foot, when lying heaped up and incapable of locomotion. This is the best time to destroy them, as the worms are scattered over the whole tree, and the perfect insect is much too nimble to allow itself to be caught. Were the base of each tree encased in a low, open box, about a foot or 18 inches in height, placed at the same distance from the main trunk, having its lower part sunk four or five inches below the surface of the soil, the top capped with strips of bright tin, sloping inwards, and projecting on both sides like the eaves of a house, and the upper half of the inside boards painted every morning with coal tar or some other viscid substance, the larvæ could not crawl out or over it, the helpless and motionless pupæ would be found collected in heaps within the enclosure, and could be killed by thousands without much trouble. It might be advisable to cover the ground inside with cement or mortar, so that the worms could not possibly burrow underneath

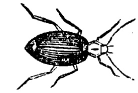
the board fence and escape. The same box might also succeed in keeping the female of the canker worm from ascending the fruit trees to deposit her eggs, but in that case coal tar should be put on the outside of the box, as these insects want to crawl inside in order to climb up the trunk, instead of descending and then scattering themselves over the surface of the ground, like the elm-tree beetle. Such temporary boxes might be made so as to be removed when not required, and put into some safe place to be used another season. If stationary, the same tin gutters now so extensively used in the northern States to obstruct the canker worm, and usually placed around the tree itself, could be put around the box at some distance from the tree, and so prevent the oil, tar, or whatever is in them from being spilled and injuring the bark, and at the same time answer the purpose just as well, in preventing the wingless female from ascending the trunk to deposit her eggs.

The western potato beetle, Colorado bug, or ten-lined spearman, has been very injurious to the potato crops during the last few years in the western States. It appears to be rapidly spreading towards the east, the rate of progress eastward assumed to be about fifty miles a year. The Practical Entomologist, a very valuable monthly journal, formerly published by the Entomological Society, of Philadelphia, but now unfortunately discontinued for want of sufficient patronage from the very farmers to whose interests it was entirely devoted, contains many interesting articles on this insect, in one of which Dr. Walsh calculates that they may reach the Atlantic coast by the year 1880. The habits of the western potato beetle, *Doryphora* (*Polygramma, Chevr.*, of Melsheimer's catalogue) *decim lineata*, are as follows: The eggs are deposited by the female, to the number of about seven hundred, (according to Dr. Henry Schirmer, in the Practical Entomologist,) at intervals during forty days, on the leaves of the potato, in somewhat regularly arranged loose clusters. After the lapse of about six days they hatch into larvæ, which feed upon the foliage of the plant about seventeen days; they then descend to the ground, where they change into pupæ at the surface of the earth. The perfect beetle appears about 10 to 14 days after the pupæ is formed, begins to pair in about seven days, and on the fourteenth day commences to deposit her eggs, thus requiring about 50 days from egg to egg again. This period may, however, vary somewhat according to the state of the weather, and the abundance or paucity of food when in the larva state. There is another insect almost exactly similar in color, size, and form to this potato beetle, found in the middle and southern States, which is mentioned in Melsheimer's catalogue as a synonym under the name of *Doryphora (Polygramma) juncta, Germ.* This insect merely differs from the *decim lineata* by having the second and third stripes always united behind, and the edges of all the stripes with a single row of punctures; the legs also have a black spot in the middle of all the thighs. This insect (the *D. juncta*) I found and raised in South Carolina upon the horse nettle (*Solanum Carolinense*) and the Department has received several specimens from Montgomery, Alabama, where they fed upon potatoes and egg plants, being reported as especially injurious to the latter. The larvæ of the *decim lineata* are destroyed by a plant-bug, *Harpactor cinctus*, and other insects of the same order. Dr. Benjamin Norris, of Pittsfield, Illinois, found a species of ground beetle, *Lebia grandis*, feeding voraciously upon the larvæ in a potato field in that neighborhood. Hundreds of this comparatively rare insect were taken by him in the same locality, and always preying upon the grubs of the potato beetle, for the destruction of which many plans have been suggested. Mr. J.

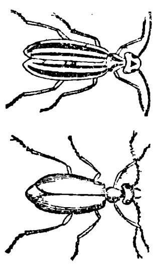


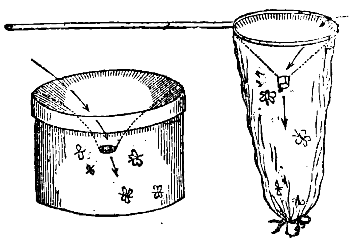






S. Little, of Rei, Ripley county, Indiana, in a communication to the Department states that, "Driving them out of the field with twigs or branches, and an application of lime and ashes, were both tried, but with no success." He then used "sawdust saturated with coal oil, in the proportion of half a gallon of the coal oil to a bushel of sawdust, sowing it broadcast among the plants. This drove the insects away for a day or two, but they soon returned, and were as injurious as ever." This remedy, however, even if successful, would be rather expensive in a large field. Another remedy he proposes is "a weak lime sprinkled over the plants between sundown and dark, three applications to be made at different times," and adds in a postscript, "this remedy was tried in the year 1867, and proved effectual." If brine is used, however, great care should be taken not to have it too strong or too much of it, else the remedy would be as bad as the disease, and both potato beetles and plants would be killed at the same time. In this letter he merely uses the common name "potato bug," and leaves us in doubt whether it is the old eastern blister fly, or the new western pest he alludes to.* However, the same remedies would be applicable to both these insects. Straw placed loosely over the plants will protect them somewhat from the insect, but would cost too much when spread over a large field. If the larvæ and perfect beetles are beaten off the plants into pans, as is frequently done, it would be advantageous to have the vessels, which are to receive them when they fall from the plants, made of smooth tin, shaped somewhat like a spittoon but much deeper, with the slope inwards to the central hole in the top, or a much greater inclination so that the insects would readily slide down and fall into the main case, where, once in, they could not possibly escape This top might also be made much larger, and shallow, funnel-shaped, if desired, to cover more space, and be attached to a bag. The same vessels might be used for the rose beetle and other insects which fall to the ground when disturbed. Where open-mouth bags or sweeping nets are used to sweep them off the foliage, this plan might be modified by using a net or bag somewhat like the fish baskets in rivers and creeks—that is, with a double net or bag attached to a hoop, the outer one being very long, conical, and with an opening at the lower end, which can be closed by means of a string, and through which the insects captured can be shaken into hot water; the inner net to be also conical but shallower, with a smooth round hole in the centre through which the beetles are swept when the net is forced over or under the plants. This orifice might be made of tin and closed with a cork when the net is nearly full, or when not in use. Such a net could be made of any size or shape, and would undoubtedly be of much utility, as the insects, once swept into the inner part, could not possibly escape, as is frequently the case when open-mouthed sweeping nets are used. The ring of the net by which the mouth is kept open can readily be made of common telegraph wire; any straight and strong stick will answer for a handle, and the bags may be made of canvas or strong muslin. The edges of the hoop to which the net is fastened ought to be protected by a covering of leather or some such material, as the muslin is subject to be worn away by friction when beating the plants. Powdered hellebore is reported to have been used with effect as a means of destroying both the Colorado potato bug and the gooseberry or currant worms, if dusted over and under the foliage when the plants are wet with dew. Hellebore, however, is a somewhat dangerous remedy, on account of its poisonous qualities. Soot also





* Since writing the above, specimens of the insects spoken of by Mr. Little as the "Colorado bug" have reached the Department, and prove to be merely varieties of the *Cantharis*, or potato bug of the eastern States.

has been used with good effect. Some of the agricultural papers recommend knocking the insects off the plants between the rows and then burying them by means of the plough when working the ground the second time. The Colorado bug or ten-lined spearman is reported to have produced poisonous effects on several persons who handled them incautiously with naked hands, somewhat in the same manner as the eastern potato *cantharis* or blister fly.

In the Prairie Farmer, vol. 19, p. 51, a correspondent states that Dr. Walsh estimated that the damage done by this insect, in the northwest alone, amounted to $1,750,000.

The Department has received many communications on the subject of the western locust, or hateful grasshopper of Dr. Walsh, and the ravages committed by them in the western States. These insects appear in vast armies, devouring every green thing, like the locusts mentioned in the Scriptures, and which may be reckoned yet among the plagues of the eastern States. Several packages of their eggs, forwarded to the Department, hatched out early in March, but the young insects all perished for the want of a suitable place in which to preserve them. From correspondents we learn much of their habits and will condense that information as much as possible. The female locust, in the autumn, deposits her eggs in small holes or cells made in the earth by means of her ovipositor. Most of these eggs remain all winter uninjured by the frost, and hatch the following spring, earlier or later according to the influences of climate. Cold rains in the spring, however, are said to destroy the young insects. The grasshoppers when first hatched exactly resemble the old insects in form, with the exception that they have no wings or wing cases. Rudimentary wings and wing cases are developed when they cast their skins, but they are as yet perfectly incapable of flight, and can merely walk or jump from plant to plant; and it is only when they have shed their skins for the last time that they acquire fully developed wings and are capable of any flight whatsoever. This insect, from the egg to the perfect state, is injurious, devouring almost any vegetable substance, (sorghum and osage orange alone being excepted by some of our correspondents;) and is most easily destroyed by wholesale when young and unable to fly, as the perfect insect when disturbed can readily escape by a rapid and prolonged flight. When young they feed near the place where they were hatched, and upon whatever vegetation is growing in the vicinity. When fully grown, with perfect wings, they collect together, pair, and emigrate in countless myriads to other places in search of food and proper places in which to deposit their eggs for the next year's crop, after doing which they soon die and disappear. In the Practical Entomologist, Dr. Walsh states that he does not think the hateful grasshopper will ever cross the Mississippi to pass onward to the eastern States, and recommends the authorities to offer a bounty for every bushel of eggs.

The western grasshopper (*Caloptenus spreta*) differs from its eastern relative, the red-legged locust of Harris, (*Caloptenus femur rubrum*,) merely by having the wings much more elongated so as to be adapted for long flights. In habits they are much alike, as Harris states that the red-legged locust feeds on grass, leaves, and vegetables, and is also migratory. The red-legged locust, in certain seasons, collects in

great numbers, and some years ago, in certain parts of New York, did considerable damage, especially to garden vegetables, not sparing even unripe red peppers. A planter in Texas, as a remedy for the western locust or grasshopper, recommends that—

As soon as the grasshopper has laid its eggs the planters plough their fields and turn the soil over so that the eggs will be buried under a layer of earth, which will crush them and thus destroy the spring crop of grasshoppers. This experiment has been made in small spots of ground where myriads of eggs were deposited, and not a grasshopper came from under the layer of soil that covered the eggs.

A correspondent, Mr. John Gardner, of Gardnersville, Utah, writes:

The people turn out *en masse*, spread straw where the grasshoppers are thickest, and set it on fire. Some dig ditches and turn the water in, and so destroy bushels of the little things when they are young and helpless.

Mr. Louis Elrod, Nebraska, writes:

We fear we shall not have the pleasure of reaping where we have sowed, in consequence of the eggs deposited by the grasshoppers last fall. The scope of country in which they are deposited extends from far up the Platte and Missouri rivers down to nearly the centre of Kansas.

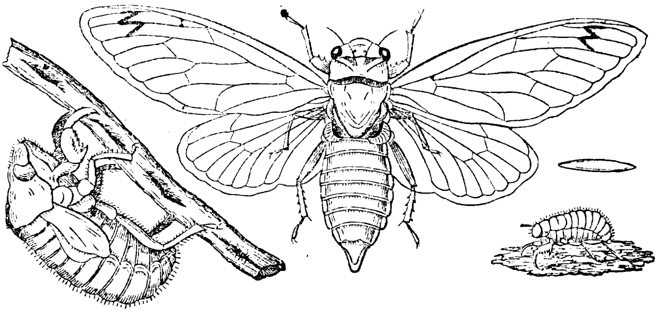
It would take too much space here to enumerate all the letters received about the ravages of this insect; notices of them have already appeared in the monthly report of the Department of Agriculture. I will, however, make one more extract from a correspondent, Mr. Oscar J. Strong, Pocahontas county, Iowa, who sent a package containing two flies (*Tachina* or *Sarcophaga*) closely resembling in general appearance the common house-fly, but larger, of a gray mottled color, with the end of the abdomen reddish brown, and very bristly or hairy. Mr. Strong says:

This fly lives in the larva state in the red-legged locust. After it consumes the interior of the locust it comes out a footless grub, with a slim head and a dark reddish stripe along its back. It immediately goes into the ground, where it remains in the pupa state sixteen or seventeen days, and then assumes the perfect or imago state. This species of fly is making great havoc among the locusts, which have been so uncomfortably plentiful this year.

If these insects destroy the red-legged locusts, there is very little doubt but that they will also attack its near relative, the hateful grasshopper of the west. This letter is especially interesting, as these families of two-winged flies have usually hitherto been observed to attack soft-bodied larvæ only, as caterpillars, etc., and I have found the larvæ of the hawk-moths, such as the tobacco fly and potato worm, especially liable to be destroyed by them. The female fly deposits her eggs on one of the first three segments of the body of the caterpillar, and glues them to the skin by means of a viscid substance. This appears to be done in order to prevent the caterpillar turning its head around to bite them off with its jaws, as most probably it would do were the eggs deposited lower down the body. When the flies are hovering round its head or in the act of depositing the eggs the worm appears to be exceedingly uneasy, constantly moving its head and foreparts with a jerking motion, and endeavoring by all the means in its power to reach the place where the eggs are with its jaws, probably instinctively recognizing its agile foe and its own fate, if it allows the fly to obtain a settlement and the eggs to be deposited. Acting upon the same instinct, in the case of the grasshopper, the fly will probably lay its eggs at the junction of the head and thorax, or near the abdomen, where the young larva will find a soft place through which it can readily penetrate and devour the insect. When caterpillars are attacked, the young footless grubs penetrate the body immediately when hatched, and feed internally upon the fatty matter until nearly ready to change, when they bore their way out through the skin and enter the earth, the caterpillar soon perishing from exhaustion. After the grub has buried itself, its body contracts so as to form an oval case, the outer skin hardens, turns brown, and becomes a cocoon-like hard oval ball, inside of which the perfect fly is ultimately formed, which, when ready to come forth, bursts one of the ends of its case, emerging into the outer world a perfectly formed fly, pairing in the course of a few days, and depositing its eggs on other caterpillars, and then dying. These flies, although exceedingly beneficial to the farmer, are especially annoying to the entomologist who is studying the changes of any particularly injurious caterpillar sent to him for identification, in order to find out what moth will be produced, so as to recognize the enemy in all its forms, as frequently out of four larvæ only one perfect moth has come forth, the rest producing merely these parasitic flies. The caterpillars infested may, however, be readily known

by examining the first three segments of the body, and if any eggs appear glued to its surface the specimen is almost certain to die before completing its changes. Besides the remedies already mentioned for destroying the eggs of the western locust or grasshopper, crushing and killing the young insects by means of a large roller, has been spoken of; the young grasshopper, however, being exceedingly agile, many doubtless would make their escape. It has been proposed not to burn the prairies in the autumn as is usually the practice, but to defer it until spring, when the young grasshoppers are yet wingless and the grass dry, then to set fire to it in circles as much as possible, so that the insects cannot escape from the ring of fire, but be driven by the heat and smoke into the centre, where they will eventually perish in the flames. In the eastern States, where the red-legged grasshopper abounds, the nets already mentioned could be used with advantage, and if the insects have been killed by immersion in boiling water, they could be given as food to poultry, etc., kept in enclosures where they cannot find any insects. The only trouble yet found with this net is that it sometimes collects a great deal of rubbish, such as leaves, sticks, etc., and the centre openning is liable to become clogged with such substances if not examined and cleaned out every few minutes.

We have received a very valuable paper from Mr. A. Crocker, of Burlington, Kansas, containing a list of the birds found in his neighborhood which destroy the locust or hateful grasshopper; but, however interesting to the naturalist, it is too long to be inserted in this report, and merely proves that immense numbers are destroyed by our small feathered allies. In Maryland, late in the summer and autumn, numbers of dead grasshoppers have been observed on the tops of high grass or weeds, clinging fast to the plants, with their feet firmly and stiffly clasped around the stems, with their skins and inner substance perfectly dry and crisp. On being cut open no signs of parasitic insects were found, and the insects had apparently died from exhaustion. Grasshoppers are also frequently found covered more or less with small parasitic red mites, which appear to attach themselves to the living insect. Many grasshoppers thus infested were kept for the purpose of finding out whether these parasites would eventually kill them; but they lived for several weeks, apparently healthy and as vigorous as ever.



As the 17-year cicada *(cicada septendecim,)* otherwise generally known by the local but incorrect name of locust, have appeared in many places, and numerous inquiries have been made about its habits and periodical appearance, at stated intervals of 17 or 14 years in immense numbers, I will give a brief history of the insect from the letters of correspondents and my own observations. The eggs are deposited, to the number of 6 to 18, in longitudinal fissures, bored, generally, in pairs in the twigs and smaller branches of forest and fruit trees, by means of the saw or file-like ovipositor of the female. Dr. Harris states that 15 or 20 such fissures are made by one insect. The eggs, which are of a yellowish white color, and of long tapering form, when about to hatch may be known by having two black dots or specks at one end. These, probably, are the rudimentary eyes of the enclosed larvæ; and later, or just before hatching, the form of the body and limbs of the future insect may be traced through the semi-transparent egg envelope. The larvæ hatch in the course of some weeks,

according to the heat and dampness of the atmosphere, moisture probably accelerating the process considerably, as some eggs taken out of a branch for the purpose of experiment, and which had no appearance of the insect through the egg-shell, but with the two before-mentioned black spots slightly developed, when laid upon moistened sand and paper at 3 o'clock one day, hatched out the following morning about 11, while the eggs remaining in the branch showed no symptom of hatching. The larvæ, when liberated from the egg-case, present the exact appearance of the pupa-skins left on the bushes, with the exception of the total absence of the wing-cases; and they are furnished with perfect legs, the two foremost of which are formed for digging or burrowing. This fact is stated merely as it has been reported that the larvæ come out as small footless grubs, and, as such, feed for some time on the pith of the branch before assuming the cicada form. The larvæ, when just hatched, are exceedingly nimble, running about in all directions, looking very much like the minute yellowish-white larvæ of the *tettigonia*, or grape-leaf hopper, (also miscalled "thrips,") with the exception of their large, crooked fore-feet, as above mentioned. When fairly out of the egg-shell, the young larvæ fall from the branch and bury themselves in the earth. In the larvæ state they are said to feed underground upon the sap from the roots of trees, shrubs, and grass; but, in the Prairie Farmer of 1851, a correspondent says that "the larvæ obtains its food (consisting of exudations like animal perspiration) from the small vegetable radicles which everywhere pervade the earth, for which purpose its rostrum or snout is provided with three exceedingly delicate capillaries or hairs, which project from the snout, and sweep over the surface, gathering the minute drops of moisture. This is their only food." Other naturalists insist that the larvæ insert the proboscis itself into the roots and regale themselves with the extravasated sap which naturally follows the wound; and Miss Morris, in a communication to the Academy of Natural Science in Philadelphia, even accuses them of causing the disease called the yellows in the peach tree by their constant punctures and subsequent drainage of the sap. This is probably an erroneous conjecture, as I have repeatedly dug up and examined peach trees dying with the yellows, but could never discover cicada larvæ on or near the roots. After burying themselves in the earth, nothing more is seen or heard of the "17-years' locust," in the same locality, for a certain period of years, excepting occasionally, when deep holes are dug into the earth, in making cuts for railroads and digging wells or cellars, when the larvæ are accidentally disentombed from depths, ranging from 4 to 12 feet under the surface of the earth, and duly chronicled in the local papers among the extraordinary events. The pupæ differ from the young larvæ merely by having the rudimentary wings and wing-cases fully developed on each side of the body, and, when ready to change into perfect cicadas, gradually ascend and remain near the top of their burrows, some six or eight inches below the surface of the soil, for a few days, apparently taking a good rest after the hard work they have had to bore their way upwards. Just before casting their last skin and becoming perfect insects. the pupæ crawl out of their holes, climb up some tree, shrub, or fence, cling fast to it by means of their strong hooked claws, and, their skin splitting open on the back, the perfect cicada creeps out, leaving the hardened cast skin clinging to the object upon which it had undergone its last change. When first emerged from the pupa skin, the body of the insect is soft and of a pale yellow color; the perfect wings are soon developed, and the insect rests supinely for some time, until it acquires its natural color and strength; it then makes its jarring noise, miscalled song, which is merely the call of the male, flies from tree to tree, pairs, and the female lays its eggs for the next 17-years' crop, and dies.

A curious fact was observed in Maryland at the latter part of the "locust season." Many of the males were seen flying about, apparently happy and lively, with nearly half the hinder part of the abdomen entirely gone, as if broken off, and its remaining cavity perfectly hollow or partially filled with a very fine dry

powder. During their perfect state it is generally supposed that the cicadas do comparatively little injury to vegetation, as, although they are accused of piercing the tender bark in order to obtain the sap, no visible injury has been known to result from such punctures, excepting the exudation of a small quantity of superabundant juices; and it is by the rough-edged and ragged punctures made by the ovipositor of the female that the great injury is done, especially to young bearing fruit trees, as the branches or twigs frequently die or are much injured as far up as the punctures extend. As it has likewise been stated that the instinct of the female locust teaches her to cut the branch just below the punctures, so as to cause the branch to fall to the ground, it may be proper to state that out of hundreds of branches wounded not one was found thus cut, excepting when it had been previously done by one of the long-horned beetles, or some other insect of similar habits, and that, when found partially broken off, the breakage always occurred where the fissures were bored deeper than usual or close together, and frequently in the very middle of a row of eggs, and sometimes near the end, so that, were the branch even to fall to the ground, more of the eggs would remain on the branch adhering to the tree than had fallen.

Reports, also, have been circulated about the sting of the locust killing persons, their eggs in fruit poisoning others, and hogs dying after eating them. I have yet to receive the first reliable account of any death, or even injury, resulting from such stings. Perhaps, when the eggs are deposited, the female may eject some liquid serving to develop the egg, but when handled the insect exhibits no inclination to use her ovipositor as a weapon either of offence or defence; and, were their stings as fatal as represented, it is really marvellous that we have not heard of a dreadful mortality this year among children living in the country, who carry them in their bosoms, hands, or hats with perfect impunity; but persons stung by any large insect whatever during the cicada season, after having heard of the fatal effect of such a sting, would, naturally enough, be in too great a hurry to examine their assailant very minutely, and, no doubt, would attribute their injury to the much-dreaded and misnamed "locust."

A short time after the so-called locust season many insects make their appearance which are capable of inflicting very dangerous wounds, such as the sawback or *Reduvius novenarius*, mentioned in a former report. It is also a well-known fact that an immense hornet (*Stizus speciosus*) is in the habit of seizing the common cicada and conveying it off to serve as food for its young larvæ. Many have been taken this year in the very act of dragging the locusts to their nests, after having stung them so as to render them powerless and incapable of resistance. The W-shaped dark markings on the wing are also frequently regarded as omens foretelling war, want, &c., or any unfortunate word beginning with a W. Why may it not as well signify wonderful wealth, or welfare? When the skin of the perfect insect is yet soft and tender, ants have been seen to kill them, and even when full grown they are attacked by the same insects at the tender place between the head and thorax, and the head is frequently completely severed from the body. I have seen numbers of such headless bodies lying upon the ground swarming with small brown ants. Dr. Gideon B. Smith, of Maryland, devoted much of his time to studying the habits of the cicada, and was considered the best authority on this subject in the middle States. In his manuscript unpublished notes he says the insect "appeared in Maryland, Pennsylvania, and Delaware, in 1766, 1783, 1800, 1817, 1834, the date of his work, and then afterwards in 1851 and 1868;" thus establishing their regular 17 years' appearance in this district. Dr. Smith, however, thinks there are two tribes, differing only from each other in the period of their lives, the northern being 17 years, and the other or southern tribe requiring only 13 years in which they perform their transformations. He states likewise that "it has no mouth or other means of taking food than three small hairs in its snout, which in feeding are spread out over the surface of the roots or leaves of trees, and these collect the

vegetable juices and carry them by capillary attraction to the stomach. In Maryland the pupæ begin to leave the ground about the 20th of May, the greatest numbers appearing about the 27th, and then diminish until the 5th of June. The 15th of June the females commence depositing eggs, and continue to do so until the 20th, the eggs from one insect being about 400. The old locusts disappear about the 25th of June, and about the 25th of July the eggs begin to hatch and the young larvæ to enter the ground." He then makes a remark totally at variance with the generally received opinion of the locust larvæ, wandering at great depths through the earth in search of roots, upon the sap of which they are said to feed. "Having made its way into the earth," he says, "it lives during the remainder of the season in the vegetable subsoil, and on the approach of cold weather forms around itself a cocoon or shell by cementing the particles of earth together, in which condition the locusts are often dug up in gardening and excavating, without their real character being discovered." Now comes the curious part of this extract, which says, "the next season it opens one end of its cell to gain access to the small roots and moist earth, but does not leave the cell, and thus it continues from season to season, each year enlarging its cell, but never changing its locality from the time it enters the earth until the time it emerges." Were this really the case, it is somewhat singular that the larvæ are not more frequently turned up when trenching gardens, or when using the subsoil plough. The generally received supposition is that the larvæ descend to a considerable depth in the earth, and far below the reach of the plough or spade.

The males alone of the cicada make the jarring noise popularly supposed to sound like the word Pharaoh, the females, contrary to the usual habits of the sex, being perfectly silent, and not musically inclined. The organs of the male by which the sound is produced are situated on the back under the shoulders of the hind wings, and can readily be seen by lifting up the wings and bending the body downwards so as to expose the upper part of the abdomen. They consist of two whitish membranes, ridged like a shell, stretched over a cavity, one on each side of the body. Dr. Smith observes that "a curious effect is produced on the eggs of poultry after feeding almost exclusively on locusts, as the yolks will be found to be almost white in color." I will finish the subject of locusts *(Cicada)* by making merely two extracts from our correspondence, one from a northern and the other from a southern observer. Mr. William E. Baker, of Ickesburg, Pennsylvania, writes:

June 5, 1868, cicadas coming up out of the ground; 8th, noisy; 10th, quite numerous; 14th, pairing, and puncturing young last year's bark, and sucking sap from trees—the amount of sap extracted must be considerable and perhaps injurious; 19th, cicadas laying eggs; 28th, cicada larvæ leaving twigs.

This last note I do not understand, as it is generally conceded that it requires a much longer time than nine days for the eggs to hatch. The first of those kept by the Department did not hatch until the 27th of July, and even then only after being placed on damp paper. Mr. Baker adds:

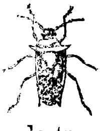
The injury done to the twigs and limbs of trees by the cicada is mechanical, and not a kind of poisoning; comparatively few of the punctured limbs die, but some are much injured, and there is generally more injury done on high ground than in the valleys. * * Some reports have been put in circulation that the sting of the locust *(Cicada)* is always very dangerous, and generally fatal; but all the cases I have heard of lack just what every case should have, *i. e.*, reliable evidence; and I have never seen in these insects any disposition to use the ovipositor to sting with, and they manifest no inclination to be resentful, even when roughly handled.

These last remarks agree perfectly with what I have already observed. Mr. Charles Petty, of Gowdysville, South Carolina, states that "the insects were here in 1842 and 1855, making their period only 13 years; of these dates I am certain." He then adds:

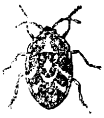
An old citizen of this county says he is certain that they were here in 1814, 1828, and 1842, making their period up to that date 14 years; and it was remarked by many in 1855 that

the locusts came up a year before their time. Taking these facts into consideration with other evidence. I am disposed to think that up to 1842 their period was 14 years, and after that it was 13 years. * * * * In 1855 a farmer in the neighborhood dug the grubs up in the low lands two feet below the surface, and a person of veracity informs me that in digging a grave the larvæ were found three feet below the surface in hard red clay.

No difference was observed in the specimens sent to the Department from various States, excepting that a lot sent from Illinois were very remarkably smaller than any of the others, although the same in form, and markings, and general appearance.



Mr. Thomas E. Pleasants, of Petersburg, Virginia, in June forwarded to the Department several specimens of a small grayish plant-bug, *Mormidea (Œbalus) typhea*, and in the accompanying letter states that "these insects have not been observed in this part of the country before, but recently have appeared in myriads in the wheat-fields of the neighboring county of Chesterfield. They prey on the wheat-ears, destroying their fruitfulness." This may possibly be the case, as the insect is furnished with a piercer like that of the well-known "squash-bug;" but it would be advisable for some naturalist in that neighborhood next season to keep some of the insects in confinement, in order to ascertain whether they suck the juices from the plant itself, or from the grain, as peradventure it may happen to be engaged in destroying the small orange-colored larvæ of the wheat midge, which lives in the ears, and is well known to injure wheat, and thus, instead of proving an enemy to be dreaded and destroyed, it may turn out to be a useful ally by diminishing numbers of a very destructive insect.



From North Carolina we have received specimens of another plant-bug, *(Strachia histrionicha, Hahn,)* beautifully marked and variegated with red and black, which our correspondent states is very numerous in his neighborhood, and totally ruins the cabbage crop. This insect is also mentioned in the Prairie Farmer, vol. 18, p. 152, as having been received from Dr. Lincecum, of Texas, where it proved very destructive, not only to cabbages, but also to radishes, mustard, turnips, and almost all the *Cruciferæ*. The eggs are deposited on end in two rows, cemented together, and generally placed on the under side of the leaf, in March. The larvæ mature in 12 or 14 days from the time of leaving the egg, and feed upon the juices of the plant, which they extract by means of their piercer or sucker; and the punctures apparently poison the leaf, causing it to wither away around the wound. There are two broods in the season, and the insect passes the winter in the perfect state. Should they multiply so as to become a nuisance, as they hybernate in the perfect state concealed beneath bark, under brush-heaps, or stones, like the cotton red-bug, it would be well in winter to search for them in such situations, and in spring to destroy them on their first appearance upon the young plants, before they have had time to deposit their eggs and to multiply to such a degree as to render their extermination impossible. Mr. Allen Crocker, of Burlington, Kansas, sent a very small striped plant-bug, *(Capsus linearis,)* which he found piercing the fruit-buds of apple trees and grape vines. These punctures, he says, "render the buds abortive."

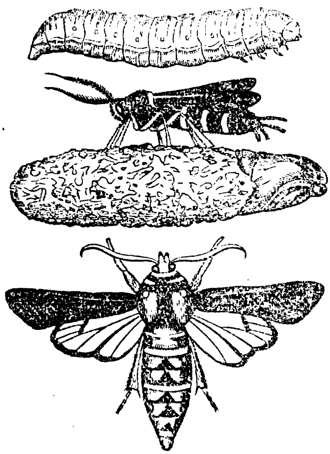
He also forwarded a specimen of a small beetle of a long form and brown color, *Bostrichus* (*Apate*) *aspericollis* (*Germ.*,) which injures the white hickory, by "boring in the pith downwards."

Mr. Meigs, of Washington, found great numbers of small round-backed, creamy, clay-colored beetles *(Colaspis strigosa,* of Ulke's collection) to be very destructive this year to the foliage of his grape-vines. *Fidea murina* (*Dej.*) was very plentiful on the grape leaves in Washington, and did much damage by eating holes in them. This insect has been frequently mistaken by grape cultivators for the rose beetle, *Macrodactylus subspinosa*, but is smaller, much browner in color, and not such a sprawling, long-legged insect as the rose-bug, which in Maryland is also

exceedingly destructive to the foliage and blossoms of the grape. A very small beetle, with short wing covers, somewhat like some of the Staphylinidæ *Heliomanes bimaculatus* (*Say*,) was taken out of a branch of the walnut where the larvæ had been evidently feeding on the wood, and a long-horned beetle, *Oncideres cingulatus* (*Say*,) was found in September in the pupa and imago states in the cavities of hollowed-out young branches of the hickory in Maryland. Some of the larvæ about to change were taken at the same time, and the branches were girdled or cut in much the same manner as when branches are injured by the well-known oak-pruner.

It may be interesting for entomologists to know that the caterpillars of a butterfly (*Melitæa phaeton*) were found in great numbers feeding upon the foliage of the arrow wood, (*Viburnum dentatum*.) The caterpillars are covered with bristly spines and of a black color, banded or winged with yellow or orange. The caterpillars of the *Utetheisa* (*Deiopeia*) *bella*, the beautiful moth seen so frequently flying about our meadows, with upper wings of yellow orange, variegated with white marking and black spots, and under-wings of pure light carmine, bordered with black, feed upon the seeds of the rattle-box, (*Crotalaria*.) generally inside the pod. This accounts for the food-plant not having been found before, as it is only when the pod is examined, and a round hole gnawed through the exterior is seen, that the caterpillar will be found snugly ensconced in the interior. The caterpillar is somewhat hairy, and beautifully banded with orange, black, and white rings.

Specimens of the root of the grapevine destroyed by the grape-borer (*Ægeria polistiformis*) have been received from Dr. F. J. Kron, Albemarle, North Carolina. The larvæ of this insect, in general appearance, resemble those of the peach-



tree borer, and work in the same manner under ground, but destroy the roots by gnawing into them, and are sometimes said to be shielded from outward applications by a coating of the bark. Specimens of the perfect insect have been received by the Department from Ohio, and it is also mentioned as occurring in Kentucky and Missouri. It is evident that this pest is spreading, and may in a short time prove as disastrous to the vineyards as the peach-tree borer is to the peach orchards. This insect working underground, its ravages cannot be seen until the vine becomes sickly. It is, therefore, absolutely necessary for the grape-grower to examine the roots of all the unhealthy-looking grapevines in the vineyard, wherever the insect has effected a lodgement in the neighborhood, at least twice a year, and any larvæ or pupæ found should be cut out and destroyed at once. The Scuppernong grape alone is said to be exempt from the attacks of the grapevine borer. The pupæ are formed in rough oval cocoons of a gummy substance, covered outwardly with particles of wood and dirt, and the perfect insect makes its appearance from June to September. This insect is also mentioned by Dr. Walsh in his first able report as acting entomologist to the State of Illinois. In this report he also speaks of a new grape curculio, *Cœliodes inæqualis*, (*Say*,) which bores holes into the berry or fruit of the grape, and a grape-leaf gall-louse, *Dactylosphæra vitifoliæ*, (*Fitch*,) which causes green, fleshy excrescences, about the size of a pea, on the lower surface of the leaf. It is found principally on the Frost and Clinton grape, and something very similar has been found in Maryland on wild grapevines.

Trypeta pomonella, (*Walsh*,) or apple-maggot fly, is a very small two-winged fly, proceeding from the larvæ or grubs found in fruit previously perforated by

the codling or apple-moth. The injury it does is in destroying the pulpy substance of apples.

A small caterpillar, living in little, crooked, horn-like cases, feeds upon the foliage of the apple, crab and plum, generally on the terminal limbs, binding the leaves together. The moth produced from it is the *Phycita nebulo*, (*Walsh*,) and is of a whitish-gray color, somewhat marbled or barred with darker brown, and having a light bar or stripe crossing the upper wing, about two-thirds of the way from the body. A similar insect taken in Maryland, on a species of thorn-bush, the plum gauger (*Anthonomus prunicida*) of Dr. Walsh, is a small curculio which bores a round hole in the fruit—not crescent shaped, like the true plum curculio, but resembling the puncture of a pin—in which to deposit its eggs, five or six such perforations being sometimes found in one plum. It differs from the plum weevil or curculio by the perfect insect boring these holes also, for the sake of food, and the larvæ or grubs, instead of feeding upon the fleshy part of the plum near the stone, bore their way through the flesh to the kernel, and then devour the substance of the kernel exclusively.

The larvæ of a very small moth (*Semasia prunivora* of Dr. Walsh's report) inhabit the plums infested by the curculio. This insect is likewise found in the black knots on plum trees and in galls on the elm and oak. In the Prairie Farmer, vol. 14, p. 131, Dr. Walsh also mentions a small species of curculio, (*Anthonomus quadrigibbus*) or four-humped curculio, the perfect insect of which eats round holes in apples, both as food and to form a place in which to deposit its eggs.

Dr. Fitch, in his report for 1866 to the New York State Agricultural Society, gives interesting articles on the onion fly, (*Anthomyia ceparum*,) a small two-winged fly, the larvæ of which bore into the bulbs, causing the plants to decay, and thus do great injury; and on the cabbage fly, (*Anthomyia brassica*,) the larvæ of which erode and bore into the roots of young cabbage plants. The radish is also destroyed by another fly, (*Anthomyia raphani*,) or radish fly, the larvæ of which injure the radishes in a similar manner to those above mentioned. Dr. Fitch also treats upon several other insects in this report injurious to vegetables.

The above notes contain merely a short and somewhat imperfect review of the newly discovered injurious insects mentioned in entomological reports, as a sort of index to show those which have lately been described by our State entomologists, and also to serve as a guide to persons who wish to investigate their habits more fully from the original sources of information. Unfortunately, not having specimens of these insects in our cabinet, I am at present unable to give any wood cuts of them, but must refer our readers to the articles and figures in the reports of Dr. Fitch and Dr. Walsh.

Mr. C. V. Riley, in his able answers to correspondents of the Prairie Farmer, mentions several insects lately found to be destructive to vegetables, amongst which will be noted the description of a saw fly or strawberry worm, *Emphytus maculatus*, (*Norton*,) Pr. Far., vol. 19, p. 368, the larvæ of which eat the foliage of the strawberry plants. They differ from the white pine worm, *Lophyrus abbottii*, which they somewhat resemble, by their habit of curling up in spiral form when on the leaf, and dropping to the ground when disturbed, instead of throwing back the head in the manner of the pine worm, which lives principally on white pine, whilst its near relative, *Lophyrus lecontei*, confines its depredations mostly to the Scotch and Austrian pines. Mr. Riley also gives an account and figures of the clover worm, *Asopia costalis*, (*Pyralis olinalis*, of Prairie Farmer, vol. 19, p. 261.) The caterpillars of this insect abound in clover stacks, and feed upon the hay. Some sent to the Department by Mr. Riley fed on the fresh flowers, but refused to touch the green leaves.

The oyster shell bark louse or scale insect, *Aspidiotus conchiformis*, is said to be exterminated by washing the tree with a mixture of two parts of soft soap, eight parts water, and lime enough to give it the consistence of whitewash.

This must be applied in the month of June, or when the insect is young and in a comparatively unprotected state.

The *Scolytus caryæ*, Prairie Farmer, vol. 19, p. 68, a small brown beetle, bores holes in the wood of the butternut and hickory, (*Carya amara*,) about the size of a No. 8 shot. The caterpillars of a moth, *Gortyna nitila*, (*Guén.*) Prairie Farmer, vol. 19, p. 116, bores into the pith of the stalk of the dahlia and aster, and destroys the plant. The caterpillars of a moth, very similar in size and color to the boll worm or corn moth, has been described by Mr. Riley as destroying the phlox. The insect is the *Heliothis phloxiphaga*, (Prairie Farmer, vol, 19, p. 219.) There are two broods annually, and the second brood hybernate in the pupa state.

With regard to the culture of the new Ailanthus silk worm, *Samia Cynthia*, formerly introduced into this country from France, where it was very highly spoken of, I am sorry to say that it does not appear to have succeeded in any practical point of view, as, unless the trees are protected by nets or other means, the caterpillars feeding upon them are nearly all destroyed by birds or parasitic insects. This insect is now, however, perfectly acclimated, and may be taken in the wild state in Brooklyn, Philadelphia, and other places where they have escaped from confinement, and bred upon Ailanthus trees in the neighborhood. Many of our own silk-producing insects would no doubt succeed quite as well in the open air, if not better, and make as fine durable silk, but would also be subject to the attacks of birds and parasites. Mr. Gallaher, of Washington, is this year experimenting with the *Platysamia cecropia*, and has succeeded in reeling the silk from the cocoon; and Mr. Trouvelot, of Medford, Massachusetts, has tried for several years with the *Polyphemus*, but with what success I cannot say, having received no report on the subject from Massachusetts. Neither have I heard of any practical results from the silk-bearing spider from the southern States, experimented with two or three years ago. Mr. Gallaher, of Washington, District of Columbia, has raised a lot of common silk-worms (*Bombyx mori*) very successfully in the open air; and for the purpose of proving the osage orange (*Maclura aurantiaca*) as a proper food for silk-worms, a number of them were fed entirely on the leaves of that plant, in the Department, doing very well.

Mr. Prevost, of California, who is quite an enthusiast on the subject of silk culture, sent splendid specimens of California-raised cocoons, together with a lot of eggs, and the Silk Growers' Manual, which have already been distributed by the Department to those most interested in raising silk-worms. Mr. Prevost claims that California is better adapted for the silk-worm than any other country, owing to the mildness and dryness of the climate. In a letter to the Department, dated August, 1867, he doubts if the silk-worm can be profitably raised in the eastern States, and says that—

> Previous to my coming to California, in 1849, I resided in New York State, and I know all about the silk culture there. The *Morus multicaulis* speculation was got up by a few schemers to make money, as it is impossible to raise silk there properly, for two reasons, the first of which is the frost is too strong and destroys the trees; and secondly, the climate does not suit the worms, as during the time of feeding, the rain-storms, thunder and lightning destroy the worms—one such storm alone having in one instance killed all the worms.

In the same letter he states that over three million mulberry trees were growing finely in different places in California, and thinks that Sacramento will be the first silk district in the State. In a letter dated San José, May, 1868, Mr. Prevost states that the European varieties sent to him hatch earlier than those bred in California. He also says "the silk culture is progressing rapidly in California; millions of cocoons will be raised this year, and we have now not less than five millions of trees growing in the State." He likewise thinks that Utah Territory is well adapted to the silk culture, judging from some samples of silk from there, and adds: "Brigham Young is planting 160 acres in mulberry trees, and others are starting it on a small scale." I merely give the above extracts

from Mr. Prevost's correspondence with the Department, to show the extent to which silk culture has already progressed in California. and I sincerely hope that it may prove profitable enough to become a new source of wealth to this country, especially as the disease is killing most of the silk-worms on the continent, and the culture of silk there is, therefore, decreasing; and that it may not prove a failure as in the time of the *Morus multicaulis* fever, by persons entering into it merely for the purpose of speculation, who are totally ignorant of the plant itself and of the habits and transformations of the silk-worm, as in the case of our correspondents who wrote for eggs of the *Samia cynthia*, and at the same time wanted seed of the ailanthus to raise the trees upon which the worms were to feed. The Department also received several varieties of the silk-worm (*Bombyx mori*) eggs, from Mr. Israel Diehl, who lately returned from Asia. where he had been to make fresh importations of the Angora goats. These eggs were distributed among the silk-growers for the purpose of finding out what varieties were best adapted to our climate, but no reports have as yet been received from the recipients, excepting one from Mr. C. V. Riley, the well-known State entomologist of Missouri, whose knowledge and experience of insect life and transformations are so well known, and upon whose statements the utmost reliance can be placed. His report to the Department, being so minute in detail and so valuable in every point of view to those engaged in silk culture, is given in full:

HON. HORACE CAPRON—DEAR SIR: In accordance with your request I send you, without entering into minute detail, the result of my experiments with the three varieties of silk-worms with which you furnished me, viz., the White Egin, Yellow Egin, and Yellow California.

The worms of all three kinds commenced hatching on the first day of May, and fed on an average 33 days before spinning up. I started with about 1,000 of each kind, and fed them all on the white mulberry, (*Morus alba.*) They were scarcely distinguishable from each other up to the time of the 3d moult; nor differed from those bred in Europe in anything but a somewhat shorter space of time between each moult, and a comparatively brief term of sickness. They were all healthy, and I scarcely lost a worm up to the third moult, from which time a decided difference was manifest, the contrast being sufficiently great to make the experiment interesting and important. The result may be briefly stated as follows:

WHITE EGIN—Appeared at first to do the very best, and were of larger size than the others. Commenced to die after 3d moult, and the majority of them failed to pass through the 4th. Obtained but 11 cocoons. These were of large size of perfectly ovoid form, and true to their name, also perfectly white. The silk was also of fine quality, but the cocoons were thin; five of the worms died before completing; three made an abortive attempt to pupize, while the two which became chrysalides failed to give out the moth. The worms fed somewhat longer and grew larger than the others, and were more inclined to blue-white than cream-white in color. They also developed less regularly; for worms placed together which had all moulted on the same day would show a divergence of two and even three days before the next moult.

YELLOW EGIN—Developed much more regularly and few died. They were of a uniformly rich cream-color after the last moult, which they sustained with little loss, and spun well and freely. The cocoons were of a dull pale yellow, of medium size, dense, and weighed well. They were often restricted, however, peanut-fashion, in the middle, and the silk was coarse, and without much gloss. The moths appeared in exactly 14 days from the time the worm commenced spinning, and produced abundance of ova.

YELLOW CALIFORNIA.—In hardiness intermediate between the other two kinds. Went through their moults well-nigh as regularly as the Yellow Egin; averaged the same size, and produced cocoons of a deep glossy yellow, perfect in form but of less weight and density than the foregoing. The moths came out on an average two days later, had the wing-marks more distinct and were somewhat less fertile.

SUMMARY.—Passing over all that has been said for and against sericulture in this country, I am confident that each of the yellow varieties will do well in this latitude, and that the rearing of them would form profitable amusement to hundreds of families in the State. I give the decided preference to the Yellow Egin, which even did well in the open air, as long as unmolested by birds or predacious insects. Indeed their exemption from disease was surprising, considering that they were often fed leaves three days plucked, and that press of business prevented the attention they should have had. While the Yellow California worms fed well on lettuce till after the second moult, the Yellow Egins did not relish it, and the White Egins would not touch it, although they perforated for about two days young tender apple leaves.

Respectfully,

C. V. RILEY.

If it is proved another season that silk-worms can be raised in the open air, would it not be well to make an experiment with a few on the osage orange hedges growing so luxuriantly in the western States? If at any considerable distance from the house, the worms would be very subject to the attacks of birds and parasitic insects, and if not properly taken care of, many of the worms would undoubtedly wander off and be lost at the time of making their cocoons.

During the last year many valuable contributions have been made to the Entomological cabinet, among the principal of which are a fine collection of Lepidoptera from Texas, by Dr. Linceceum, through the Smithsonian Institution; a number of valuable Lepidoptera from Mr. Allan Crocker, of Burlington, Kansas; and a collection of Canadian Lepidoptera, from Mr. Wm. Saunders, of London, Ontario county, Canada. The new or rare insects have all been figured, and the Lepidoptera will shortly be described by Mr. Edwards, of Coalburg, West Virginia, and Messrs. Grote and Robinson, of New York, who make a specialty of this order, and possessing the best libraries on the subject, with abundant material for comparison, are much better qualified to describe and name new species, than others who have not the same advantages; and it is hoped thus to avoid in future the long list of synonyms which merely serve to encumber our catalogues and perplex the young entomological student.

As the entomologist of the Department has also charge of the museum, it may be proper to state that in the new building of the Department of Agriculture there will be ample room in the museum for any specimens of grains, fruits, fibres, &c., &c., that may be sent, and that any package weighing not more than two pounds may be sent free of expense through the General Post Office, if directed to the Department. It is intended to have one part of the museum especially devoted to the principal products of each State, arranged in separate cases so as to exhibit at a glance their principal economic, mineral, animal, vegetable, or manufacturing resources, in order to enable emigrants to judge, before settling down, what are the products of each State, and to what cereals, fruits or fibres it is especially adapted, and whether it is best adapted for mineral, agricultural or manufacturing purposes. It is, therefore, hoped that each State society will contribute its peculiar products, so as to be represented in the National Museum at Washington. Were each specimen properly numbered, and the duplicates preserved in the various State museums, such a collection of facts would be gradually amassed as would be invaluable for the purpose of reference, and farmers would be enabled to ascertain whether certain cereals, fruits, &c., improve or deteriorate by cultivation in their individual States. As the plan of the National Agricultural Museum has already been explained in former reports, I will not here reproduce it, but will conclude this paper by soliciting all interested in agricultural pursuits to make such contributions as will be useful in proving facts, and thus render the Department at Washington of real and practical value to the entire country, by enabling it to disseminate knowledge and answer questions on the various agricultural subjects from the objects themselves in the museum.

TOWNEND GLOVER.

Hon. HORACE CAPRON, *Commissioner*

REPORT OF THE STATISTICIAN.

SIR: In my report upon the facts of agriculture for 1866 there appeared, amid much that was prosperous and cheering, a few circumstances that were discouraging and unpropitious. The wheat harvest, for the third consecutive year, had proved deficient; the corn crop had been injured by early frosts, and other farm products were variable in their yield and value; in the south it was as yet uncertain who would work and who would play, and cotton suffered from years of neglected culture, and was worked at too great expense for labor and supplies. There were everywhere too many consumers and too few producers. Young and old, black and white, flocked to the cities, all hoping to obtain large returns from little effort, and the natural result was an increase in prices of meats, breadstuffs, fruits, and vegetables, which were still more enhanced by speculators, hucksters, and the whole race of middlemen, in their effort to obtain more for selling than farmers were allowed for producing the prime essentials of subsistence.

While labor in agriculture was thus reduced in quantity, in quality it was more efficient than ever by reason of the stimulus of high prices, and the economy of farm implements, and but for a season in some respects unfavorable, an abundant yield of the fruits of the earth would have been obtained.

The year 1867 has been more fruitful than its predecessor, giving to bread consumption an increase of forty millions of bushels of wheat, and to the manufactories of the world a half million of bales more of cotton. Corn, of which a great breadth had been planted, and high hopes of large results indulged, was stricken in its favorite prairie zone with drought of much severity, and the harvest was scarcely equal in quantity, though superior in quality, to that of 1866.

The winter cereals were grown upon a slightly diminished area in Ohio, Indiana, Kansas, and Texas; in most of the western States the breadth of the previous season was either maintained or increased; in the southern States a general desire to become self-supporting led to an increase of the acreage of bread crops to the extent of 20 per cent. The aggregate result was a slight increase over the area of the previous year, which was too small for the wants of the country, even had there been entire exemption from the casualties from which it suffered. The condition of the crop in spring, as compared with that of the previous year, gave greater promise than the increase of acreage; throughout the country there was little complaint of winter-killing, which had been so prevalent in former years; and, as summer advanced, few reports of damage from unpropitious weather, lodging, insects, or rust, were prevalent. It was evident that a fruitful wheat year was assured. In some portions of the south there was a little damage from rust, which was mainly confined to the foliage. The average yield per acre was not large, but it was all that can ever be expected for the entire country until more careful culture, and some regard to crop rotation shall obtain among wheat growers. The estimated average yield per acre for the the year is 11.5 bushels; the estimated total yield, 212,000,000 bushels.

Corn.—The extension of the area in corn was more marked and general; only Maine, New Hampshire, New York, and South Carolina, appear to have reduced their breadth of planting. Preparation was made for a large crop; the

season, however, was unpropitious for rapid and healthy growth in the spring, and in the summer a drought of much severity involved the best corn region of country, the Ohio valley, causing in many localities a reduction of one-half in yield, and cutting down the average for the State of Illinois to 23.8 bushels per acre.

Oats.—The yield of oats has been increased from 3 to 4 per cent. over the preceding crop, yet proving less than was expected in Maine, Vermont, New York, Virginia, Mississippi, Texas, Tennessee, and Kentucky. The western States have generally advanced their production. The southern section also shows a larger product from more extended fields. The quality is variable, the grain being heavier in the more northern latitudes, tending everywhere to deterioration under careless culture.

Barley.—The barley crop has proved deficient to the extent of 3 or 4 per cent. Illinois, Kansas, Pennsylvania, New York, and all the eastern States, except Massachusetts and Connecticut, share in the deficiency, yet the reduction in New York, which produces 40 per cent. of the crop, is equivalent to the aggregate diminutions—the comparative losses and gains of the other States balancing each other.

Peas.—It is gratifying to note the increase of the crop of field peas, the great forage crop of the south, so valuable an adjunct in the production of beef and pork, and so useful as an meliorator of the soil.

Sorghum.—Sorghum has suffered a material decline for several years, which is continued, causing despondency to producers.

Cotton.—The cotton crops of 1866 and 1867 are all that could reasonably be expected, in view of the radical change in labor and the impoverished condition of planters. That of the former year amounted to fully 1,900,000 bales, while that of the 1867 was increased to about 2,500,000 bales. It was the boast of European buyers, at the breaking out of civil war in this country, that the supremacy of the cotton of North America was broken, and that efforts in stimulating production in Egypt, Brazil, China, and India would be successful in obtaining full supplies for European manufacture. Under the stimulus of high prices a large increase was drawn from remote sections of India; by the aid of steam machinery Egypt more than doubled her production, and other countries greatly extended their exports. In this state of facts the opinion became quite prevalent that cotton planting in the United States must be abandoned as a general crop. It is true that in 1866 the British imports of India cotton exceeded the importation of the American fibre, but the following figures show how the tables have been turned upon India in a single year, and how Great Britain has increased her American purchases, while those of India, China, Turkey, Mexico, and other countries have been diminished, with a diminution of the total importation:

Cotton, raw, from—	1866.	1867.
	Cwts.	*Cwts.*
United States	4,643,370	4,715,733
Bahamas and Bermuda	7,515	10,623
Mexico	3,145	22
Brazil	611,808	628,761
Turkey	92,996	57,024
Egypt	1,055,900	1,127,541
British India	5,493,770	4,449,259
China	52,120	4,707
Other countries	335,249	278,981
Total	12,295,873	11,272,651

For the purpose of comparison, the following statement in pounds of British imports for 1850, 1860, and 1867, respectively, is appended:

	1850.	1860.	1867.
United States	493, 153, 112	1, 115, 890, 608	528, 162, 096
Brazil	30, 299, 982	17, 286, 864	70, 421, 232
Mediterranean	18, 931, 414	44, 036, 608	....
Turkey	....	....	6, 386, 688
Egypt	....	....	126, 284, 592
British East Indies	118, 872, 742	204, 141, 168	498, 317, 008
British West Indies	228, 913	1, 050, 784	....
Bahamas and Bermuda	....	....	1, 189, 776
Other countries	2, 090, 698	8, 532, 720	31, 775, 520
Total	663, 576, 861	1, 390, 938, 752	1, 262, 536, 912

Not only has this country regained its superiority in quantity, but in price the advantage is still more marked. In Liverpool, February 27, New Orleans middling commanded $9\frac{9}{16}d.$; fair, $10\frac{1}{2}d.$; Surat middling, fair, $7\frac{5}{8}d.$; fair to good fair, $8\frac{1}{8}$ to $8\frac{3}{8}d.$; Madras middling, fair, $7\frac{1}{4}d.$; good fair, $7\frac{1}{2}$ to $8d.$ This shows a difference of from four to five cents per pound, or about twenty-five per cent., between the gross returns of Indian and American cottons. With this advantage, exemption from tax, and a self-sustaining system of agriculture in the South, in which cotton shall play only an incidental part, there is no reason why we cannot grow again five millions of bales, *and manufacture it all*, at no very distant day, for the supply of the markets of the world.

Tobacco.—A reduction in the yield of tobacco, to the amount of fully 20 per cent., is indicated. This is a crop with which it is very easy to glut the markets of the world. A comparatively small acreage is ample for domestic wants and for exportation.

For particulars of these and other crops the reader is referred to the tables of estimates, which must of course be regarded only as estimates, in the main closely approximating correctness, while in minor points occasional inaccuracy may exist.

Yield per acre.—The average yield per acre of farm crops, as shown by deductions from the aggregate estimates, for the entire country, indicates plainly the wastefulness and want of system in the practice of a majority of American farmers. Small as the figures appear, they are assuredly not very wide of the true average, and are quite as likely to be too large as too small. The natural tendency in making local estimates is to give too great a prominence to the crops of a few good farmers, and quite too little attention to the meagre results of the many poor cultivators. The following is the average arrived at, as the yield per acre, of some of the principal crops, in 1867: corn, 23 bushels; wheat, 11.5; rye, 13.5; oats, 26; barley, 23; buckwheat, 17; potatoes, 82. The average for tobacco is 631 pounds.

The largest State estimate for corn is that of Kansas, which is 38.6 bushels. Vermont stands next, 36.2 bushels; Nebraska, 36 bushels; South Carolina, with the lowest yield, 9.6 bushels. Some surprise may be felt that the yield of corn in New England should equal that of the best corn belt of the west; but there is nothing strange in the fact, if taken in connection with the special fertilization and careful culture actually demanded as conditions of any success in eastern corn-growing.

California produces the largest average wheat yield. Some of the New England States give comparatively high averages, though the area sown is very small; and of the western States Nebraska and Kansas report the highest

results. It is a suggestive fact concerning the wheat-growing States that the yield per acre in each is very nearly in inverse ratio to the time that has elapsed since the settlement of the State.

The highest average for potatoes is that of Florida, 143 bushels per acre; Texas, 130; Vermont, 116.9; Michigan, 95.5; Illinois, 60.

The general average for the tobacco yield is increased by the highly stimulated culture of the Connecticut seed leaf, in which large quantities of concentrated fertilizers are used. The estimate for Connecticut is 1,266 pounds per acre; Massachusetts, 1,100; Michigan, 1,000. The estimate for Virginia is 690 pounds; Maryland, 453; Kentucky, 552; Tennessee, 620.

Value per acre.—The average home value of each product per acre, for the whole country, is as follows: corn, $18 75; wheat, $23; barley, $20 25; rye, $19; oats, $16; buckwheat, $19; potatoes, $74 88; tobacco, $82 45; hay, $18 60; cotton, $33.

CROPS OF 1867.

A.—*Showing the amount in bushels, &c., of each principal crop of the several States named, the yield per acre, the total acreage, the average price in each State, and the value of each crop, for* 1867.

Products.	Amount of crop of 1867.	Average yield per acre.	Number of acres in each crop.	Value per bushel, ton, or pound.	Total valuation.
MAINE.					
Indian corn ......bushels..	1,575,000	33.4	47,155	$1 59	$2,504,250
Wheat ......do....	181,000	10.6	17,075	2 79	504,990
Rye ......do....	155,000	14.8	10,472	1 61	249,550
Oats ......do....	2,069,000	22	94,045	80	1,655,200
Barley ......do....	623.000	18.3	34,043	1 13	703,990
Buckwheat ......do....	356,000	21.9	16,255	99	352,440
Potatoes ......do....	3,503,000	86.6	40,450	93	3,257,790
Tobacco ......pounds..	....	....	....	....	....
Hay ......tons..	1,050,000	1	1,050,000	14 62	15,351,000
Total	....	....	1,309,495	....	24,579,210
NEW HAMPSHIRE.					
Indian corn ......bushels..	1,413,000	35.5	39,802	1 56	2,204,280
Wheat ......do....	299,000	12.1	24,710	2 89	864,110
Rye ......do....	147,000	14.7	10,000	1 62	238,140
Oats ......do....	1,540,000	27.5	56,000	80	1,232,000
Barley ......do....	107,000	24.5	4,367	1 24	132,680
Buckwheat ......do....	82,000	22.3	3,677	1 00	82,000
Potatoes ......do....	2,843,000	97.5	29,158	81	2,302,830
Tobacco ......pounds..	20,000	500	40	18	3,600
Hay ......tons..	798,000	1	798,000	15 00	11,970,000
Total	....	....	965,754	....	19,029,640
VERMONT.					
Indian corn ......bushels..	1,520,000	36.2	41,988	1 52	2,310,400
Wheat ......do....	700,000	15.8	44,303	2 76	1,932,000
Rye ......do....	147,000	15	9,800	1 62	238,140
Oats ......do....	4,506,000	30.1	149,700	77	3,469,620
Barley ......do....	102,000	23.4	4,358	1 46	148,920
Buckwheat ......do....	225,000	25.4	8,858	97	218,250
Potatoes ......do....	4,297,000	116.9	36,757	69	2,964,930
Tobacco ......pounds..	15,000	500	30	18	2,700
Hay ......tons..	1,000,000	1	1,000,000	15 36	15,360,000
Total	....	....	1,295,794	....	26,644,960
MASSACHUSETTS.					
Indian corn ......bushels..	2,363,000	35.7	66,190	1 53	3,615,390
Wheat ......do....	172,000	16	10,750	2 81	483,320
Rye ......do....	441,000	15.6	28,269	1 58	696,780

Table showing the amount in bushels, &c., of each principal crop, &c.—Continued.

Product.	Amount of crop of 1867.	Average yield per acre.	Number of acres in each crop.	Value per bushel, ton, or pound.	Total valuation.
MASSACHUSETTS—Continued.					
Oats ....bushels..	1, 342, 000	26. 7	50, 262	$0 90	$1, 207, 800
Barley ....do....	144, 000	22. 6	6, 371	1 54	221, 760
Buckwheat ....do....	83, 000	18	4, 611	1 14	94, 620
Potatoes ....do....	2, 613, 000	96	27, 218	1 11	2, 900, 430
Tobacco........pounds..	3, 619, 000	1100	3, 290	22	796, 180
Hay........tons..	1, 032, 000	1. 3	793, 846	22 12	22, 827, 840
Total........	....	....	990, 807	....	32, 844, 120
RHODE ISLAND.					
Indian corn........bushels..	340, 000	25. 7	13, 229	1 64	557, 600
Wheat ....do....	1, 000	16. 9	59	2 72	2, 720
Rye ....do....	34, 000	15	2, 266	1 65	56, 100
Oats ....do....	154, 000	27	5, 703	84	129, 360
Barley ....do....	35, 000	25	1, 400	1 42	49, 700
Buckwheat ....do....	3, 000	15. 5	193	1 16	3, 480
Potatoes ....do....	364, 000	72. 5	5, 020	1 16	422, 240
Tobacco........pounds..	....	....	....	....	....
Hay ....tons..	67, 000	1. 1	60, 909	26 62	1, 783, 540
Total........	....	....	88, 779	....	3, 004, 740
CONNECTICUT.					
Indian corn........bushels..	2, 242, 000	33	67, 939	1 50	3, 363, 000
Wheat ....do....	75, 000	17. 5	4, 285	2 63	197, 250
Rye........do....	931, 000	14	66, 500	1 63	1, 517, 530
Oats ....do....	2, 878, 000	27. 5	104, 654	85	2, 446, 300
Barley ....do....	19, 000	23. 2	818	1 45	27, 550
Buckwheat........do....	216, 000	13	16, 615	1 17	252, 720
Potatoes ....do....	962, 000	68	14, 147	1 10	1, 058, 200
Tobacco........pounds..	6, 664, 000	1266	5, 263	23	1, 532, 720
Hay........tons..	718, 000	1. 3	552, 307	21 60	15, 508, 800
Total........	....	....	832, 528	....	25, 904, 070
NEW YORK.					
Indian corn........bushels..	19, 500, 000	30. 4	641, 447	1 32	25, 740, 000
Wheat........do....	8, 250, 000	14. 5	568, 965	2 64	21, 780, 000
Rye........do....	5, 100, 000	15	340, 000	1 50	7, 650, 000
Oats ....do....	38, 000, 000	26. 2	1, 450, 381	76	28, 880, 000
Barley ....do....	3, 879, 000	20	193, 950	1 47	5, 702, 13[illegible]
Buckwheat........do....	6, 541, 000	20	327, 050	1 04	6, 802, 64[illegible]
Potatoes ....do....	24, 925, 000	84	296, 726	90	22, 432, 50[illegible]
Tobacco........pounds..	8, 743, 000	533	16, 403	14	1, 224, 020
Hay ....tons..	5, 330, 000	1. 2	4, 441, 666	17 47	93, 115, 100
Total........	....	....	8, 276, 588	....	213, 326, 390
NEW JERSEY.					
Indian corn........bushels..	9, 730, 000	33. 1	293, 957	1 23	11, 967, 900
Wheat ....do....	1, 508, 000	14	107, 714	2 58	3, 890, 640
Rye........do....	1, 403, 000	13. 7	108, 978	1 63	2, 433, 590
Oats ....do....	6, 628, 000	27	245, 481	73	4, 838, 440
Barley ....do....	29, 000	21. 5	1, 348	1 27	36, 830
Buckwheat........do....	775, 000	19. 3	40, 155	1 33	1, 030, 750
Potatoes ....do....	2, 423, 000	56. 6	42, 809	1 41	3, 416, 430
Tobacco ....pounds..	150, 000	600	250	12	18, 000
Hay........tons..	450, 000	1. 3	346, 153	22 13	9, 958, 500
Total........	....	....	1, 186, 845	....	37, 591, 080
PENNSYLVANIA.					
Indian corn........bushels..	30, 457, 000	32	951, 781	1 17	35, 634, 690
Wheat ....do....	15, 000, 000	12. 5	1, 200, 000	2 43	36, 450, 000
Rye........do....	6, 832, 000	13. 7	498, 686	1 41	9, 633, 120
Oats ....do....	59, 900, 000	30	1, 996, 666	66	39, 534, 000
Barley ....do....	615, 000	20	30, 750	1 37	842, 550
Buckwheat........do....	8, 844, 000	16. 3	542, 576	1 13	9, 993, 720
Potatoes ....do....	11, 727, 000	74. 4	157, 620	1 04	12, 196, 080

Table showing the amount in bushels, &c., of each principal crop, &c.—Continued.

Products	Amount of crop of 1867.	Average yield per acre.	Number of acres in each crop.	Value per bushel, ton, or pound.	Total valuation.
PENNSYLVANIA—Continued.					
Tobacco .... pounds..	4, 712, 000	725	6, 499	$ 09	$424, 080
Hay .... tons..	2, 424, 000	1. 3	1, 864, 615	14 83	35, 947, 920
Total	....	....	7, 249, 193	....	180, 656, 160
DELAWARE.					
Indian corn .... bushels..	3, 639, 000	16. 3	223, 251	1 02	3, 711, 78
Wheat .... do....	685, 000	9. 3	73, 655	2 38	1, 630, 300
Rye .... do....	32, 000	7	4, 571	1 50	48, 000
Oats .... do....	2, 711, 000	16. 6	163, 313	73	1, 979, 030
Barley .... do....	5, 000	23. 8	210	1 27	6, 350
Buckwheat .... do....	20, 000	16. 6	1, 204	1 22	24, 400
Potatoes .... do....	256, 000	41. 6	6, 153	1 00	256, 000
Tobacco .... pounds..	10, 000	500	20	10	1, 000
Hay .... tons..	30, 000	1. 6	18. 750	17 66	529, 800
Total	....	....	491, 127	....	8, 186, 660
MARYLAND.					
Indian corn .... bushels..	11, 650, 000	28. 4	410, 211	1 09	12, 698, 500
Wheat .... do....	5, 435, 000	11	494, 090	2 43	13, 207, 050
Rye .... do....	524, 000	13. 4	39, 104	1 45	759, 800
Oats .... do....	7, 620, 000	23. 2	328, 448	68	5, 181, 600
Barley .... do....	25, 000	26	961	1 27	31, 750
Buckwheat .... do....	198, 000	18. 8	10, 531	1 20	237, 600
Potatoes .... do....	1, 205, 000	71	16, 971	1 10	1, 325, 500
Tobacco .... pounds..	22, 472, 000	453	49, 607	12	2, 696, 640
Hay .... tons..	213, 000	1. 3	163, 846	17 54	3, 736, 020
Total	....	....	1, 513, 769	....	39, 874, 460
VIRGINIA.					
Indian corn .... bushels..	18, 490, 000	20. 9	884, 689	85	15, 716, 500
Wheat .... do....	6, 713, 000	8	839, 125	2 12	14, 231, 560
Rye .... do....	768. 000	8. 5	90, 352	1 14	875. 520
Oats .... do....	9, 425, 000	17	554, 411	48	4, 524, 000
Barley .... do....	5, 000	12. 3	406	1 05	5, 250
Buckwheat .... do....	141, 000	12. 3	11, 463	97	136, 770
Potatoes .... do....	1, 480, 000	67	22, 089	66	976, 800
Tobacco .... pounds..	90, 000, 000	690	130, 434	12. 5	11, 250, 000
Hay .... tons..	224, 000	1. 2	186, 666	12 48	2, 795, 520
Total	....	....	2, 719, 635	....	50, 511, 920
NORTH CAROLINA.					
Indian corn .... bushels..	17, 974, 000	11. 6	1, 549, 482	1 04	18, 692, 960
Wheat .... do....	3, 415, 000	6, 9	494, 927	2 11	7, 205, 650
Rye .... do....	389, 000	7. 7	50, 519	1 41	548, 490
Oats .... do....	3, 479, 000	13. 3	261, 578	64	2, 226, 560
Barley .... do....	3, 000	9	333	1 50	4, 500
Buckwheat .... do....	22, 000	17. 5	1, 257	89	19, 580
Potatoes .... do....	838, 000	93	9, 010	62	519, 560
Tobacco .... pounds..	40, 212, 000	652	61, 674	17. 3	6, 956, 676
Hay .... tons..	179, 000	1. 5	119, 333	12 06	2, 158, 740
Total	....	....	2, 548, 113	....	38, 332, 716
SOUTH CAROLINA.					
Indian corn .... bushels..	7, 834, 000	9. 6	816, 041	1 15	9, 009, 100
Wheat .... do....	932, 000	6. 4	145, 625	2 38	2, 218, 160
Rye .... do....	56, 000	5. 7	9, 824	1 79	100, 240
Oats .... do....	787, 000	11. 1	70, 900	75	590, 250
Barley .... do....	7, 000	6	1, 166	2 00	14, 000
Buckwheat .... do....	....	....	....	....	....
Potatoes .... do....	169, 000	89. 4	1, 890	76	128, 440
Tobacco .... pounds..	100, 000	500	200	17	17, 000
Hay .... tons..	77, 000	1	77, 000	19 50	1, 501, 500
Total	....	....	1, 122, 646	....	13, 578, 690

Table showing the amount in bushels, &c., of each principal crop, &c.—Continued.

Products.	Amount of crop of 1867.	Average yield per acre.	Number of acres in each crop.	Value per bushel, ton, or pound.	Total valuation.
GEORGIA.					
Indian corn....bushels..	29,037,000	13.1	2,216,564	$0 96	$27,875,520
Wheat....do....	2,290,000	8	286,250	2 35	5,381,500
Rye....do....	76,000	8.1	9,382	1 77	134,520
Oats....do....	1,231,000	12.4	99,274	90	1,107,900
Barley....do....	12,000	14.3	839	2 03	24,360
Buckwheat....do....	....	....	....	....	....
Potatoes....do....	309,000	101	3,059	62	191,580
Tobacco....pounds..	1,290,000	515	2,504	30	387,000
Hay....tons..	59,000	1.3	45,384	21 58	1,273,220
Total....	....	....	2,663,256	....	36,375,600
FLORIDA.					
Indian corn....bushels..	2,500,000	11.8	211,864	1 38	3,450,000
Wheat....do....	1,400	7.9	177	2 20	3,080
Rye....do....	11,000	8	1,375	1 70	18,700
Oats....do....	15,000	17	882	1 25	18,750
Barley....do....	3,000	14.3	209	2 00	6,000
Buckwheat....do....	....	....	....	....	....
Potatoes....do....	15,000	143	104	1 10	16,500
Tobacco....pounds..	500,000	500	1,000	30	150,000
Hay....tons..	10,000	1.2	8,333	21 00	210,000
Total....	....	....	223,944	....	3,873,030
ALABAMA.					
Indian corn....bushels..	35,500,000	16.2	2,191,358	79	28,045,000
Wheat....do....	954,000	7.8	122,307	2 05	1,955,700
Rye....do....	42,000	7.9	5,316	1 63	68,460
Oats....do....	597,000	11.7	51,025	87	519,390
Barley....do....	8,000	14.4	555	1 96	15,680
Buckwheat....do....	....	....	....	....	....
Potatoes....do....	482,000	72.4	6,657	59	284,380
Tobacco....pounds..	321,000	600	535	34	109,140
Hay....tons..	92,000	1	92,000	20 00	1,840,000
Total....	....	....	2,469,753	....	32,837,750
MISSISSIPPI.					
Indian corn....bushels..	19,657,000	15.7	1,252,038	1 09	21,426,130
Wheat....do....	240,000	9.5	25,263	2 40	576,000
Rye....do....	22,000	11.5	1,913	1 92	42,240
Oats....do....	90,000	13	6,923	1 07	96,300
Barley....do....	9,000	8	1,125	1 50	13,500
Buckwheat....do....	....	....	....	....	....
Potatoes....do....	412,000	85	4,847	78	321,360
Tobacco....pounds..	120,000	500	240	30	36,000
Hay....tons..	40,000	1.3	30,769	16 43	657,200
Total....	....	....	1,323,118	....	23,168,730
LOUISIANA.					
Indian corn....bushels..	9,535,000	15.6	611,217	1 10	10,488,500
Wheat....do....	40,000	8	5,000	2 50	100,000
Rye....do....	15,000	12.5	1,200	1 92	28,800
Oats....do....	60,000	14	4,285	1 62	97,200
Barley....do....	....	....	....	....	....
Buckwheat....do....	....	....	....	....	....
Potatoes....do....	241,000	101	2,386	1 21	291,610
Tobacco....pounds..	15,000	500	30	30	4,500
Hay....tons..	46,000	1.5	30,666	19 75	908,500
Total....	....	....	654,784	....	11,919,110
TEXAS.					
Indian corn....bushels..	20,716,000	28.2	734,609	75	15,537,000
Wheat....do....	794,000	9.5	83,578	1 89	1,500,660
Rye....do....	100,000	16.3	6,134	1 28	128,000
Oats....do....	813,000	23.5	34,595	79	642,270

Table showing the amount in bushels, &c., of each principal crop, &c.—Continued.

Produce.	Amount of crop of 1867.	Average yield per acre.	Number of acres in each crop.	Value per bushel, ton, or pound.	Total valuation.
TEXAS—Continued.					
Barley .... bushels..	41,000	24.8	1,653	$1 10	$45,100
Buckwheat .... do....	....	....	....	....	....
Potatoes .... do....	303,000	130.3	2,325	69	209,07
Tobacco .... pounds..	110,000	500	220	25	27,500
Hay .... tons..	17,000	1.7	10,000	16 60	282,200
Total	....	....	873,114	....	18,371,800
ARKANSAS.					
Indian corn .... bushels..	21,243,000	26.5	801,622	77	16,357,110
Wheat .... do....	870,000	9.2	94,565	2 01	1,748,100
Rye .... do....	39,000	13.2	2,954	1 31	51,090
Oats .... do....	392,000	16.7	23,473	83	325,360
Barley .... do....	4,000	15	266	2 00	8,000
Buckwheat .... do....	....	....	....	....	....
Potatoes .... do....	323,000	94	3,436	1 02	329,460
Tobacco .... pounds..	1,739,000	714	2,435	23	399,970
Hay .... tons..	9,000	1.8	5,000	20 75	186,750
Total	....	....	933,751	....	19,405,840
TENNESSEE.					
Indian corn .... bushels..	50,250,000	23.7	2,120,253	55	27,637,500
Wheat .... do....	6,017,000	8.5	707,882	2 11	12,695,870
Rye .... do....	239,000	10.5	22,761	1 20	286,800
Oats .... do....	2,644,000	15.4	171,688	62	1,639,280
Barley .... do....	20,000	19.5	1,025	1 34	26,800
Buckwheat .... do....	11,000	15	733	1 58	17,380
Potatoes .... do....	1,260,000	72.4	17,403	89	1,121,400
Tobacco .... pounds..	40,988,000	620	66,109	14	5,738,320
Hay .... tons..	151,000	1.3	116,153	18 95	2,861,450
Total	....	....	3,224,007	....	52,024,800
WEST VIRGINIA.					
Indian corn .... bushels..	6,500,000	29.7	218,855	89	5,785,000
Wheat .... do....	1,900,000	10.5	180,952	2 39	4,541,000
Rye .... do....	71,000	12.4	5,725	1 20	85,200
Oats .... do....	1,500,000	21.5	69,767	51	765,000
Barley .... do....	55,000	20.8	2,644	1 40	77,000
Buckwheat .... do....	350,000	14.8	23,648	1 07	374,500
Potatoes .... do....	650,000	69.6	9,339	81	526,500
Tobacco .... pounds..	2,100,000	690	3,043	17	357,000
Hay .... tons..	150,000	1.4	107,142	11 44	1,716,000
Total	....	....	621,115	....	14,227,200
KENTUCKY.					
Indian corn .... bushels..	46,550,000	24.7	1,884,615	65	30,257,500
Wheat .... do....	2,847,000	8.2	347,195	2 17	6,177,990
Rye .... do....	473,000	10.7	44,205	1 38	652,740
Oats .... do....	5,136,000	18.8	273,191	57	2,927,520
Barley .... do....	159,000	17	9,352	1 33	211,470
Buckwheat .... do....	11,000	12.8	859	1 28	14,080
Potatoes .... do....	1,286,000	50.7	25,364	98	1,260,280
Tobacco .... pounds..	40,000,000	552	72,463	09.7	3,880,000
Hay .... tons..	118,000	1.3	90,769	14 80	1,746,400
Total	....	....	2,748,013	....	47,127,980
MISSOURI.					
Indian corn .... bushels..	50,437,000	27.2	1,854,301	66	33,288,420
Wheat .... do....	4,961,000	12.4	400,080	2 00	9,922,000
Rye .... do....	234,000	16.2	14,444	1 15	269,100
Oats .... do....	4,314,000	30	143,800	49	2,113,860
Barley .... do....	157,000	21.1	7,440	146	229,220
Buckwheat .... do....	69,000	21	3,285	121	83,490

Table showing the amount in bushels, &c., of each principal crop, &c.—Continued.

Products.	Amount of crop of 1867.	Average yield per acre.	Number of acres in each crop.	Value per bushel, ton, or pound.	Total valuation.
MISSOURI—Continued.					
Potatoes .... bushels..	1,112,000	73.9	15,047	$0 97	$1,078,640
Tobacco .... pounds..	11,657,000	802	14,534	11.5	1,340,555
Hay .... tons..	680,000	1.7	400,000	11 11	7,554,800
Total	....	....	2,852,931	....	55,880,085
ILLINOIS.					
Indian corn .... bushels..	109,091,000	23.8	4,583,655	68	74,281,880
Wheat .... do....	28,000,000	11.4	2,456,140	1 97	55,160,000
Rye .... do....	639,000	15	42,600	1 19	760,410
Oats .... do....	32,158,000	30.1	1,068,372	49	15,757,420
Barley .... do....	996,000	22.3	44,663	1 28	1,274,880
Buckwheat .... do....	248,000	15.2	16,315	1 10	272,800
Potatoes .... do....	3,673,000	60.5	60,710	1 20	4,407,600
Tobacco .... pounds..	15,792,000	573	27,560	08	1,263,360
Hay .... tons..	2,667,000	1.5	1,778,000	9 73	25,949,910
Total	....	....	10,078,015	....	179,128,260
INDIANA.					
Indian corn .... bushels..	80,757,000	29.2	2,765,650	65	52,492,000
Wheat .... do....	16,861,000	10.5	1,605,809	2 21	37,262,810
Rye .... do....	396,000	14.1	28,085	1 18	467,280
Oats .... do....	11,174,000	10.9	1,025,137	49	5,475,260
Barley .... do....	346,000	21.1	16,398	1 22	422,120
Buckwheat .... do....	398,000	16.7	23,832	1,10	437,800
Potatoes .... do....	3,094,000	73.2	42,267	97	3,001,180
Tobacco .... pounds..	7,385,000	809	9,128	09.4	694,190
Hay .... tons..	1,208,000	1.4	862,857	11 63	14,049,040
Total	....	....	6,379,163	....	114,301,680
OHIO.					
Indian corn .... bushels..	64,000,000	28.7	2,229,965	82	52,480,000
Wheat .... do....	18,000,000	11.6	1,551,724	2 36	42,480,000
Rye .... do....	1,072,000	13.4	80,000	1 26	1,350,720
Oats .... do....	23,296,000	31.1	749,067	54	12,579,840
Barley .... do....	2,520,000	24	105,000	1 29	3,250,800
Buckwheat .... do....	1,023,000	13.5	75,777	1 15	1,176,450
Potatoes .... do....	7,238,000	75.4	95,994	1 00	7,238,000
Tobacco .... pounds..	10,749,000	667	16,115	10	1,074,900
Hay .... tons..	2,219,000	1.4	1,585,000	12 32	27,338,080
Total	....	....	6,488,642	....	148,968,790
MICHIGAN.					
Indian corn .... bushels..	15,118,000	31.4	481,464	96	14,513,280
Wheat .... do....	15,250,000	12.4	1,229,838	2 34	35,685,000
Rye .... do....	600,000	17.2	34,883	1 30	780,000
Oats .... do....	8,045,000	29.5	272,711	68	5,470,600
Barley .... do....	418,000	20.9	20,000	1 36	568,480
Buckwheat .... do....	1,293,000	17.2	75,174	1 04	1,344,720
Potatoes .... do....	5,750,000	97.5	58,974	73	4,197,500
Tobacco .... pounds..	3,500,000	1000	3,500	21	735,000
Hay .... tons..	1,377,000	1.3	1,059,230	16 14	22,224,78[illegible]
Total	....	....	3,235,774	....	85,519,36[illegible]
WISCONSIN.					
Indian corn .... bushels..	9,885,000	33.6	294,196	86	8,501,100
Wheat .... do....	22,000,000	12.3	1,788,617	1 77	38,940,000
Rye .... do....	1,050,000	16.5	63,636	1 14	1,197,000
Oats .... do....	20,608,000	35	588,800	59	12,158,720
Barley .... do....	894,000	25.8	34,651	1 35	1,206,900
Buckwheat .... do....	65,000	15.6	4,166	1 00	65,000
Potatoes .... do....	4,097,000	96	42,677	69	2,826,930
Tobacco .... pounds..	100,000	650	153	20	20,000
Hay .... tons..	1,370,000	1.6	856,250	11 11	15,220,700
Total	....	....	3,673,146	....	80,136,350

Table showing the amount in bushels, &c., of each principal crop, &c.—Continued.

Products.	Amount of crop of 1867.	Average yield per acre.	Number of acres in each crop.	Value per bushel, ton, or pound.	Total valuation.
MINNESOTA.					
Indian corn .... bushels..	4, 500, 000	30	150, 000	$1 07	$4, 815, 000
Wheat .... do....	10, 000, 000	12. 5	800, 000	1 48	14, 800, 000
Rye .... do....	500, 000	18. 8	26, 595	1 11	555, 000
Oats .... do....	6, 150, 000	38	161, 842	72	4, 428, 000
Barley .... do....	350, 000	23, 6	14, 830	1 07	374, 500
Buckwheat .... do....	40, 000	14. 4	2, 777	1 25	50, 000
Potatoes .... do....	3, 150, 000	110	28, 636	92	2, 898, 000
Tobacco .... pounds..	75, 000	600	125	20	15, 000
Hay .... tons..	525, 000	1. 8	291, 666	7 28	3, 822, 000
Total	....	....	1, 476, 471	....	31, 757, 500
IOWA.					
Indian corn .... bushels..	53, 333, 000	33. 8	1, 577, 899	55	29, 333, 150
Wheat .... do....	16, 300, 000	12. 7	1, 283, 464	1 43	23, 309, 000
Rye .... do....	550, 000	19. 4	28, 350	1 04	572, 000
Oats .... do....	16, 250, 000	42	386, 904	42	6, 825, 000
Barley .... do....	1, 125, 000	29	38, 793	1 16	1, 305, 000
Buckwheat .... do....	314, 000	20. 6	15, 242	1 10	345, 400
Potatoes .... do....	3, 361, 000	108. 7	30, 919	79	2, 655, 190
Tobacco .... pounds..	386, 000	656	588	23	88, 780
Hay .... tons..	1, 250, 000	1. 9	657, 894	5 77	7, 212, 500
Total	....	....	4, 020, 053	....	71, 646, 020
KANSAS.					
Indian corn .... bushels..	8, 159, 000	38. 6	211, 373	55	4, 487, 450
Wheat .... do....	1, 250, 000	14	89, 285	1 84	2, 300, 000
Rye .... do....	4, 000	20. 3	197	1 15	4, 600
Oats .... do....	236, 000	36	6, 555	49	115, 640
Barley .... do....	6, 000	26. 7	224	1 10	6, 600
Buckwheat .... do....	31, 000	19. 7	1, 573	1 26	39, 060
Potatoes .... do....	314, 000	109	2, 880	1 02	320, 280
Tobacco .... pounds..	150, 000	550	272	22	33, 000
Hay .... tons..	162, 000	1. 9	85, 263	5 08	822, 960
Total	....	....	397, 622	....	8, 129, 590
NEBRASKA.					
Indian corn .... bushels..	2, 325, 000	36	64, 583	74	1, 720, 500
Wheat .... do....	500, 000	15	33, 333	1 32	660, 000
Rye .... do....	2, 000	25. 2	79	1 02	2, 040
Oats .... do....	450, 000	39. 2	11, 479	59	265, 500
Barley .... do....	6, 000	27	222	96	5, 760
Buckwheat .... do....	....	....	....	....	....
Potatoes .... do....	108, 000	95	1, 136	1 33	143, 640
Tobacco .... pounds..	30, 000	434	69	22	6, 600
Hay .... tons..	35, 000	1. 9	18, 421	5 54	193, 900
Total	....	....	129, 322	....	2, 997, 940
PACIFIC STATES AND TERRITORIES.					
Indian corn .... bushels..	500, 000	29. 4	17, 006	90	450, 000
Wheat .... do....	20, 000, 000	16. 6	1, 204, 819	1 10	22, 000, 000
Rye .... do....	....	....	....	....	....
Oats .... do....	2, 500, 000	38. 4	65, 104	50	1, 250, 000
Barley .... do....	13, 000, 000	23. 6	550, 847	45	5, 850, 000
Buckwheat .... do....	....	....	....	....	....
Potatoes .... do....	3, 000, 000	93. 7	32, 017	60	1, 800, 000
Tobacco .... pounds..	....	....	....	....	....
Hay .... tons..	500, 000	1. 2	416, 666	8 50	4, 250, 000
Total	....	....	2, 286, 459	....	35, 600, 000

B.—*Summary for each State, showing the amount, the number of acres, and the value of each crop, for 1867.*

States.	INDIAN CORN.			WHEAT.			RYE.		
	Bushels.	Acres.	Value of crop.	Bushels.	Acres.	Value of crop.	Bushels.	Acres.	Value of crop.
Maine	1, 575, 000	47, 155	$2, 504, 250	181, 000	17, 075	$504, 990	155, 000	10, 472	$249, 550
New Hampshire	1, 413, 000	39, 802	2, 204, 280	299, 000	24, 710	864, 110	147, 000	10, 000	238, 140
Vermont	1, 520, 000	41, 988	2, 310, 400	700, 000	44, 303	1, 932, 000	147, 000	9, 800	238, 140
Massachusetts	2, 363, 000	66, 190	3, 615, 390	172, 000	10, 750	483, 320	441, 000	28, 269	696, 780
Rhode Island	340, 000	13, 229	557, 600	1, 000	59	2, 720	34, 000	2, 266	56, 100
Connecticut	2, 242, 000	67, 939	3, 363, 000	75, 000	4, 285	197, 250	931, 000	66, 500	1, 517, 530
New York	19, 500, 000	641, 447	25, 740, 000	8, 250, 000	568, 965	21, 780, 000	5, 100, 000	340, 000	7, 650, 000
New Jersey	9, 730, 000	293, 957	11, 967, 900	1, 508, 000	107, 714	3, 890, 640	1, 493, 000	108, 978	2, 433, 590
Pennsylvania	30, 457, 000	951, 781	35, 634, 690	15, 000, 000	1, 200, 000	36, 450, 000	6, 832, 000	498, 686	9, 633, 120
Delaware	3, 639, 000	223, 251	3, 711, 780	685, 000	73, 655	1, 630, 300	32, 000	4, 571	48, 000
Maryland	11, 650, 000	410, 211	12, 698, 500	5, 435, 000	494, 090	13, 207, 050	524, 000	39, 104	759, 800
Virginia	18, 490, 000	884, 689	15, 716, 500	6, 713, 000	839, 125	14, 231, 560	768, 000	90, 352	875, 520
North Carolina	17, 974, 000	1, 549, 482	18, 692, 960	3, 415, 000	494, 927	7, 205, 650	389, 000	50, 519	548, 490
South Carolina	7, 834, 000	816, 041	9, 009, 100	932, 000	145, 625	2, 218, 160	56, 000	9, 824	100, 240
Georgia	29, 037, 000	2, 216, 564	27, 875, 520	2, 290, 000	286, 250	5, 381, 500	76, 000	9, 382	134, 520
Florida	2, 500, 000	211, 864	3, 450, 000	1, 400	177	3, 080	11, 000	1, 375	18, 700
Alabama	35, 500, 000	2, 191, 358	28, 045, 000	954, 000	122, 307	1, 955, 700	42, 000	5, 316	68, 460
Mississippi	19, 657, 000	1, 252, 038	21, 426, 130	240, 000	25, 263	576, 000	22, 000	1, 913	42, 240
Louisiana	9, 535, 000	611, 217	10, 488, 500	40, 000	5, 000	100, 000	15, 000	1, 200	28, 800
Texas	20, 716, 000	734, 609	15, 537, 000	794, 000	83, 578	1, 500, 660	100, 000	6, 134	128, 000
Arkansas	21, 243, 000	801, 622	16, 357, 110	870, 000	94, 565	1, 748, 100	39, 000	2, 954	51, 090
Tennessee	50, 250, 000	2, 120, 253	27, 637, 500	6, 017, 000	707, 882	12, 695, 870	239, 000	22, 761	286, 800
West Virginia	6, 500, 000	218, 855	5, 785, 000	1, 900, 000	180, 952	4, 541, 000	71, 000	5, 725	85, 200
Kentucky	46, 550, 000	1, 884, 615	30, 257, 500	2, 847, 000	347, 195	6, 177, 990	473, 000	44, 205	652, 740
Missouri	50, 437, 000	1, 954, 301	33, 288, 420	4, 961, 000	400, 080	9, 922, 000	234, 000	14, 444	269, 100
Illinois	109, 601, 000	4, 592, 655	74, [illegible], 280	28, 000, 000	2, 456, 140	55, 160, 000	639, 000	42, 600	760, 410
Indiana	80, 757, 000	2, 765, 650	52, [illegible], 080	16, 861, 000	1, 605, 809	37, 262, 810	396, 000	28, 085	467, 280
Ohio	64, 000, 000	2, 229, 965	52, 480, 000	18, 000, 000	1, 551, 724	42, 480, 000	1, 072, 000	80, 000	1, 350, 720
Michigan	15, 118, 000	481, 464	14, 362, 100	15, 250, 000	1, 289, 838	35, 685, 000	600, 000	34, 883	780, 000
Wisconsin	9, 885, 000	294, 196	8, [illegible], 700	22, 000, 000	1, 788, 617	38, 940, 000	1, 050, 000	63, 636	1, 197, 000
Minnesota	4, 500, 000	150, 000	4, [illegible], 000	10, 000, 000	800, 000	14, 800, 000	500, 000	26, 595	555, 000
Iowa	53, 333, 000	1, 577, 899	29, 333, 150	16, 300, 000	1, 283, 464	23, 309, 000	550, 000	28, 350	572, 000
Kansas	8, 159, 000	211, 373	4, 487, 450	1, 250, 000	89, 285	2, 300, 000	4, 000	197	4, 600
Nebraska	2, 325, 000	64, 583	1, 720, 500	500, 000	33, 333	660, 000	2, 000	79	2 040
Pacific States and Territories	500, 000	17, 006	450, 000	20, 000, 000	1, 204, 819	22, 000, 000	....	....	....
Total	768, 320, 000	32, 520, 249	610, 948, 890	212, 441, 400	18, 321, 561	421, 796, 460	23, 184, 000	1, 689, 175	32, 499, 790

B.—*Summary for each State, showing the amount, the number of acres, and the value of each crop, for* 1867—Continued.

States.	OATS.			BARLEY.			BUCKWHEAT.		
	Bushels.	Acres.	Value of crop.	Bushels.	Acres.	Value of crop.	Bushels.	Acres.	Value of crop.
Maine	2,069,000	94,045	$1,655,200	623,000	34,043	$703,990	356,000	16,255	$352,440
New Hampshire	1,540,000	56,000	1,232,000	107,000	4,367	132,680	82,000	3,677	82,000
Vermont	4,506,000	149,700	3,469,620	102,000	4,358	148,920	225,000	8,858	218,250
Massachusetts	1,342,000	50,262	1,207,800	144,000	6,371	221,760	83,000	4,611	94,620
Rhode Island	154,000	5,703	129,360	35,000	1,400	49,700	3,000	193	3,480
Connecticut	2,878,000	104,654	2,446,300	19,000	818	27,550	216,000	16,615	252,720
New York	38,000,000	1,450,381	28,880,000	3,879,000	193,950	5,702,130	6,541,000	327,050	6,802,640
New Jersey	6,628,000	245,481	4,838,440	29,000	1,348	36,830	775,000	40,155	1,030,750
Pennsylvania	59,900,000	1,996,666	39,534,000	615,000	30,750	842,550	8,844,000	542,576	9,993,720
Delaware	2,711,000	163,313	1,979,030	5,000	210	6,350	20,000	1,204	24,400
Maryland	7,620,000	326,448	5,181,600	25,000	961	31,750	198,000	10,531	237,600
Virginia	9,425,000	554,411	4,524,000	5,000	406	5,250	141,000	11,463	136,770
North Carolina	3,479,000	261,578	2,226,560	3,000	333	4,500	22,000	1,257	19,580
South Carolina	787,000	70,900	590,250	7,000	1,166	14,000			
Georgia	1,231,000	99,274	1,107,900	12,000	839	24,360			
Florida	15,000	882	18,750	3,000	209	6,000			
Alabama	597,000	51,025	519,390	8,000	555	15,680			
Mississippi	90,000	6,923	96,300	9,000	1,125	13,500			
Louisiana	60,000	4,285	97,200						
Texas	813,000	34,595	642,270	41,000	1,653	45,100			
Arkansas	392,000	23,473	325,360	4,000	266	8,000			
Tennessee	2,644,000	171,688	1,639,280	20,000	1,025	26,800	11,000	733	17,380
West Virginia	1,500,000	69,767	765,000	55,000	2,644	77,000	350,000	23,648	374,500
Kentucky	5,136,000	273,191	2,927,520	159,000	9,352	211,470	11,000	859	14,080
Missouri	4,314,000	143,800	2,113,860	157,000	7,440	229,220	69,000	3,285	83,490
Illinois	32,158,000	1,068,372	15,757,420	996,000	44,663	1,274,880	248,000	16,315	272,800
Indiana	11,174,000	1,025,137	5,475,260	346,000	16,398	422,120	398,000	23,832	437,800
Ohio	23,296,000	749,067	12,579,840	2,520,000	105,000	3,250,800	1,023,000	75,777	1,176,450
Michigan	8,045,000	272,711	5,470,600	418,000	20,000	568,480	1,293,000	75,174	1,344,720
Wisconsin	20,608,000	588,800	12,158,720	894,000	34,651	1,206,900	65,000	4,166	65,000
Minnesota	6,150,000	161,842	4,428,000	350,000	14,830	374,500	40,000	2,777	50,000
Iowa	16,250,000	386,904	6,825,000	1,125,000	38,793	1,305,000	314,000	15,242	345,400
Kansas	236,000	6,555	115,640	6,000	224	6,600	31,000	1,573	39,060
Nebraska	450,000	11,479	265,500	6,000	222	5,760			
Pacific States and Territories	2,500,000	65,104	1,250,000	13,000,000	550,847	5,850,000			
Total	278,698,000	10,746,416	172,472,970	25,727,000	1,131,217	22,850,130	21,359,000	1,227,826	23,469,650

B.—*Summary for each State, showing the amount, the number of acres, and the value of each crop, for* 1867—Continued.

States.	POTATOES.			TOBACCO.			HAY.		
	Bushels.	Acres.	Value of crop.	Pounds.	Acres.	Value of crop.	Tons.	Acres.	Value of crop.
Maine	3, 503, 000	40, 450	$3, 257, 790	....	....	....	1, 050, 000	1, 050, 000	$15, 351, 000
New Hampshire	2, 843, 000	29, 158	2, 302, 830	20, 000	40	$3, 600	798, 000	798, 000	11, 970, 000
Vermont	4, 297, 000	36, 757	2, 964, 930	15, 000	30	2, 700	1, 000, 000	1, 000, 000	15, 360, 000
Massachusetts	2, 613, 000	27, 218	2, 900, 430	3, 619, 000	3, 290	796, 180	1, 032, 000	793, 846	22, 827, 840
Rhode Island	364, 000	5, 020	422, 240	....	....	....	67, 000	60, 909	1, 783, 540
Connecticut	962, 000	14, 147	1, 058, 200	6, 664, 000	5, 263	1, 532, 720	718, 000	552, 307	15, 508, 800
New York	24, 925, 000	296, 726	22, 432, 500	8, 743, 000	16, 403	1, 221, 020	5, 330, 000	4, 441, 666	93, 115, 100
New Jersey	2, 423, 000	42, 809	3, 416, 430	150, 000	250	18, 000	450, 000	346, 153	9, 958, 500
Pennsylvania	11, 727, 000	157, 620	12, 196, 080	4, 712, 000	6, 499	421, 080	2, 424, 000	1, 864, 615	35, 947, 920
Delaware	256, 000	6, 153	256, 000	10, 000	20	1, 000	30, 000	18, 750	529, 800
Maryland	1, 205, 000	16, 971	1, 325, 500	22, 472, 000	49, 607	2, 696, 640	213, 000	163, 846	3, 736, 020
Virginia	1, 480, 000	22, 089	976, 800	90, 000, 000	130, 434	11, 250, 000	224, 000	186, 666	2, 795, 520
North Carolina	838, 000	9, 010	519, 560	40, 212, 000	61, 674	6, 956, 676	179, 000	119, 333	2, 158, 740
South Carolina	169, 000	1, 890	128, 440	100, 000	200	17, 000	77, 000	77, 000	1, 501, 500
Georgia	309, 000	3, 059	191, 580	1, 290, 000	2, 504	387, 000	59, 000	45, 384	1, 273, 220
Florida	15, 000	104	16, 500	500, 000	1, 000	150, 000	10, 000	8, 333	210, 000
Alabama	482, 000	6, 657	284, 380	321, 000	535	109, 140	92, 000	92, 000	1, 840, 000
Mississippi	412, 000	4, 847	321, 360	120, 000	240	36, 000	40, 000	30, 769	657, 200
Louisiana	241, 000	2, 386	201, 610	15, 000	30	4, 500	46, 000	30, 666	908, 500
Texas	303, 000	2, 325	209, 070	110, 000	220	27, 500	17, 000	10, 000	282, 200
Arkansas	323, 000	3, 436	329, 460	1, 739, 000	2, 435	399, 970	9, 000	5, 000	186, 750
Tennessee	1, 260, 000	17, 403	1, 121, 400	40, 988, 000	66, 109	5, 738, 320	151, 000	116, 153	2, 861, 450
West Virginia	650, 000	9, 339	526, 500	2, 100, 000	3, 043	357, 000	150, 000	107, 142	1, 716, 000
Kentucky	1, 286, 000	25, 364	1, 260, 280	40, 000, 000	72, 463	3, 880, 000	118, 000	90, 769	1, 746, 400
Missouri	1, 112, 000	15, 047	1, 078, 640	11, 657, 000	14, 534	1, 340, 555	680, 000	400, 000	7, 554, 800
Illinois	3, 673, 000	60, 710	4, 407, 600	15, 792, 000	27, 560	1, 263, 360	2, 667, 000	1, 778, 000	25, 949, 910
Indiana	3, 094, 000	42, 267	3, 001, 180	7, 385, 000	9, 128	694, 190	1, 208, 000	862, 857	14, 049, 040
Ohio	7, 238, 000	95, 994	7, 238, 000	10, 749, 000	16, 115	1, 074, 900	2, 219, 000	1, 585, 000	27, 338, 080
Michigan	5, 750, 000	58, 974	4, 197, 500	3, 500, 000	3, 500	735, 000	1, 377, 000	1, 059, 230	22, 224, 780
Wisconsin	4, 097, 000	42, 677	2, 826, 930	160, 000	153	20, 090	1, 370, 000	856, 250	15, 220, 700
Minnesota	3, 150, 000	28, 636	2, 898, 000	75, 000	125	15, 000	525, 000	291, 666	3, 822, 000
Iowa	3, 361, 000	30, 919	2, 655, 190	386, 000	588	88, 780	1, 250, 000	657, 894	7, 212, 500
Kansas	314, 000	2, 880	320, 280	150, 000	272	33, 000	162, 000	85, 263	822, 960
Nebraska	108, 000	1, 136	143, 640	30, 000	69	6, 600	35, 000	18, 421	193, 900
Pacific States and Territories	3, 000, 000	32, 017	1, 800, 000	....	....	....	500, 000	416, 666	4, 250, 000
Total	97, 783, 000	1, 192, 195	89, 276, 830	313, 724, 000	494, 333	41, 283, 431	26, 277, 000	20, 020, 554	372, 864 670

C.—*A general summary showing the estimated quantities, number of acres, and aggregate value of the principal crops of the farm in* 1867.

Products.	Number of bushels.	Number of acres.	Value.
Indian corn	768, 320, 000	32, 520, 249	$610, 948, 390
Wheat	212, 441, 400	18, 321, 561	421, 796. 460
Rye	23, 184, 000	1, 689, 175	32, 499, 700
Oats	278, 698, 000	10, 746, 416	172, 472, 970
Barley	25, 727, 000	1, 131, 217	22, 850. 130
Buckwheat	21, 359, 000	1, 227, 826	23, 469, 650
Potatoes	97, 783, 000	1, 192, 195	89, 276, 830
Total	1, 427, 512, 400	66, 828, 639	1, 373, 314, 130
Tobacco ... pounds	313, 724, 000	494, 333	$41, 283, 431
Hay ... tons	26, 277, 000	20, 020, 554	372, 864, 670
Cotton ... bales	2, 450, 000	7, 000, 000	220, 000, 000
Total	....	94, 343, 526	2, 007, 462, 231

D.—*Table showing the average yield of farm products per acre for the year* 1867.

States.	Corn.	Wheat.	Rye.	Oats.	Barley.	Buckwheat.	Potatoes.	Tobacco.	Hay.
	Bush.	*Bush.*	*Bush.*	*Bush.*	*Bush.*	*Bush.*	*Bush.*	*Pounds.*	*Tons.*
Maine	33. 4	10. 6	14. 8	22	18. 3	21. 9	86. 6	....	1
New Hampshire	35. 5	12. 1	14. 7	27. 5	24. 5	22. 3	97. 5	500	1
Vermont	36. 2	15. 8	15	30. 1	23. 4	25. 4	116. 9	500	1.
Massachusetts	35. 7	16	15. 6	26. 7	22. 6	18	96	1, 100	1. 3
Rhode Island	25. 7	16. 9	15	27	25	15. 5	72. 5	....	1. 1
Connecticut	33	17. 5	14	27. 5	23. 2	13	68	1, 266	1. 3
New York	30. 4	14. 5	15	26. 2	20	20	84	533	1. 2
New Jersey	33. 1	14	13. 7	27	21. 5	19. 3	56. 6	600	1. 3
Pennsylvania	32	12. 5	13. 7	30	20	16. 3	74. 4	725	1. 3
Delaware	16. 3	9. 3	7	16. 6	23. 8	16. 6	41. 6	500	1. 6
Maryland	28. 4	11	13. 4	23. 2	26	18. 8	71	453	1. 3
Virginia	20. 9	8	8. 5	17	12. 3	12. 3	67	690	1. 2
North Carolina	11. 6	6. 9	7. 7	13. 3	9	17. 5	93	652	1. 5
South Carolina	9. 6	6. 4	5. 7	11. 1	6	....	89. 4	500	1
Georgia	13. 1	8	8. 1	12. 4	14. 3	....	101	515	1. 3
Florida	11. 8	7. 9	8	17	14. 3	....	143	500	1. 2
Alabama	16. 2	7. 8	7. 9	11. 7	14. 4	....	72. 4	600	1
Mississippi	15. 7	9. 5	11. 5	13	8	....	85	500	1. 3
Louisiana	15. 6	8	12. 5	14	....	....	101	500	1. 5
Texas	28. 2	9. 5	16. 3	23. 5	24. 8	....	130. 3	500	1. 7
Arkansas	26. 5	9. 2	13. 2	16. 7	15	....	94	714	1. 8
Tennessee	23. 7	8. 5	10. 5	15. 4	19. 5	15	72. 4	620	1. 3
West Virginia	29. 7	10. 5	12. 4	21. 5	20. 8	14. 8	69. 6	690	1. 4
Kentucky	24. 7	8. 2	10. 7	18. 8	17	12. 8	50. 7	552	1. 3
Missouri	27. 2	12. 4	16. 2	30	21. 1	21	73. 9	802	1. 7
Illinois	23. 8	11. 4	15	30. 1	22. 3	15. 2	60. 5	573	1. 5
Indiana	29. 2	10. 5	14. 1	10. 9	21. 1	16. 7	73. 2	809	1. 4
Ohio	28. 7	11. 6	13. 4	31. 1	24	13. 5	75. 4	667	1. 4
Michigan	31. 4	12. 4	17. 2	29. 5	20. 9	17. 2	97. 5	1, 000	1. 3
Wisconsin	33. 6	12. 3	16. 5	35	25. 8	15. 6	96	650	1. 6
Minnesota	30	12. 5	18. 8	38	23. 6	14. 4	110	600	1. 8
Iowa	33. 8	12. 7	19. 4	42	29	20. 6	108. 7	656	1. 9
Kansas	38. 6	14	20. 8	36	26. 7	19. 7	109	550	1. 9
Nebraska	36	15	25. 2	39. 2	27	....	95	434	1. 9

These estimates, in comparison with a similar table for 1866, exhibit marked changes. New England shows about the same yield of corn, but the States west of the Mississippi make a material increase, while Illinois, in consequence of the drought, shows a reduction from 31.6 to 23.8 bushels. The wheat yield of the trans-Mississippi States has manifestly declined, while Ohio exhibits an increase of from 4.5 to 11 bushels. Indiana, instead of 5.9 bushels, gives an average of 10.5 bushels. The influence of partial local failures can readily be traced in this change of figures.

E.—*Table showing the average cash value of farm products per acre for the year* 1867.

States.	Corn.	Wheat.	Rye.	Oats.	Barley.	Buckwheat.	Potatoes.	Tobacco.	Hay.
Maine	$53 10	$29 57	$23 82	$17 60	$20 67	$21 68	$80 53	....	$14 62
New Hampshire	55 38	34 96	23 81	22 00	30 38	22 30	78 97	$90 00	15 00
Vermont	55 02	43 60	24 30	23 17	34 16	24 63	80 66	90 00	15 36
Massachusetts	54 62	44 96	24 64	24 03	34 80	20 52	106 56	242 00	28 75
Rhode Island	42 14	45 96	24 75	22 68	35 50	17 98	84 10	....	29 28
Connecticut	49 50	46 02	22 82	23 37	33 64	15 21	74 80	291 18	28 08
New York	40 12	38 28	22 50	19 91	29 40	20 80	75 60	74 62	20 96
New Jersey	40 71	36 12	22 33	19 71	27 30	25 66	79 80	72 00	28 76
Pennsylvania	37 44	30 37	19 31	19 80	27 40	18 41	77 37	65 25	19 27
Delaware	16 62	22 13	10 50	12 11	30 22	20 25	41 60	50 00	28 25
Maryland	30 95	26 73	19 43	15 77	33 02	22 56	78 10	54 36	22 60
Virginia	17 76	16 96	9 69	8 16	12 91	11 93	44 22	86 25	14 97
North Carolina	12 06	14 55	10 85	8 51	13 50	15 57	57 66	112 79	18 09
South Carolina	11 04	15 23	10 20	8 32	12 00	....	67 94	85 00	19 50
Georgia	12 57	18 80	14 33	11 16	29 02	....	62 62	154 50	28 05
Florida	16 28	17 38	13 60	21 25	28 60	....	157 30	150 00	25 20
Alabama	12 79	15 99	12 87	10 17	28 22	....	42 71	204 00	20 00
Mississippi	17 11	22 80	22 08	13 91	12 00	....	66 30	150 00	21 35
Louisiana	17 16	20 00	24 00	22 68	....	....	122 20	150 00	29 62
Texas	21 15	17 95	20 86	18 56	27 28	....	89 90	125 00	28 22
Arkansas	20 40	18 49	17 29	13 86	30 00	....	95 88	164 22	37 35
Tennessee	13 03	17 93	12 60	9 54	26 13	23 70	64 43	86 80	24 63
West Virginia	26 43	25 09	14 88	10 96	29 12	15 83	56 37	117 30	16 01
Kentucky	16 05	17 79	14 76	10 71	22 61	16 38	49 68	53 54	19 24
Missouri	17 95	24 80	18 63	14 70	30 80	25 41	71 68	92 23	18 88
Illinois	16 18	22 45	17 85	14 74	28 54	16 72	72 60	45 84	14 59
Indiana	18 98	23 20	16 63	5 34	25 74	18 37	71 00	76 04	16 28
Ohio	23 53	27 37	16 88	16 79	30 96	15 52	75 40	66 70	17 24
Michigan	30 14	29 01	22 36	20 06	28 42	17 88	71 17	210 00	20 98
Wisconsin	28 89	21 77	18 81	20 65	34 83	15 60	66 24	130 00	17 77
Minnesota	32 10	18 50	20 86	27 36	25 25	18 00	101 20	120 00	13 10
Iowa	18 59	18 16	20 17	17 64	33 64	22 66	85 87	150 88	10 96
Kansas	21 23	25 76	23 34	17 64	29 37	24 82	111 18	121 00	9 65
Nebraska	26 64	19 80	25 70	23 12	25 92	....	126 35	95 48	10 52

FARM STOCKS.

During the year 1867 a small gain appears in the number of all domestic animals, except sheep and swine, as follows: An increase of 355,677 horses, 33,299 mules, 342,795 cows, and 211,532 other cattle, a decrease of 393,477 sheep, and 376,276 hogs. The estimated numbers are as follows:

	Horses.	Mules.	Sheep.	Cows.	Other cattle.	Hogs.
February, 1867	5,401,263	822,386	39,385,386	8,348,773	11,730,952	24,693,534
February, 1868	5,756,940	855,685	38,991,912	8,691,568	11,942,484	24,317,258

Prices.—The estimates of prices have receded as follows: Horses, from $79 46 to $75 16; mules, from $92 52 to $77 61; milch cows, from $39 77 to $36 78; other cattle, from $21 55 to $20 86; sheep, from $3 37 to $2 52; and swine, from $5 43 to $4 55. The percentage of loss is greatest in sheep and smallest in cattle, in the following order: Sheep, 25; mules, 15; swine 14; milch cows, 7; horses 5; oxen and young cattle, 3 per centum. The reduction has been gradual and steady from the inflation of 1865, and will probably continue till the resumption of specie payments.

Total value.—The total estimated value of live stock of farms is $1,337,111,822, a decrease of $59,531,877, resulting not from a diminution of numbers but a depreciation in price; the greatest shrinkage being in the south—amounting to more than $6,000,000 in Mississippi, $5,000,000 in Texas, 5,000,000 in Alabama, and almost $10,000,000 in Kentucky. Wisconsin, Minnesota, Iowa, and Nebraska have made an increase.

The census valuation of 1860 was $908,205,495, equal at the present price of gold to $1,225,000,000 in currency, leaving $112,000,000 as the actual increase in the value of farm stock in eight years.

F.—*Showing the estimated total number and total value of each kind of live stock, and the average price, in February,* 1868.

States.	Horses.			Mules.			Oxen and other cattle.		
	Number.	Average price.	Total value.	Number.	Average price.	Total value.	Number.	Average price.	Total value.
Maine	52, 725	$84 24	$4, 441, 554				160, 207	$42 76	$6, 850, 451
New Hampshire	35, 446	75 87	2, 689, 288				115, 917	39 06	4, 527, 718
Vermont	49, 714	75 60	3, 758, 378				146, 228	33 57	4, 904, 873
Massachusetts	48, 994	84 86	4, 157, 630				107, 036	46 15	4, 939, 711
Rhode Island	6, 828	80 73	551, 224				19, 804	42 08	833, 352
Connecticut	38, 009	79 92	3, 037, 679				149, 749	41 00	6, 139, 709
New York	446, 119	91 00	40, 592, 367	2, 160	$89 64	$193, 622	748, 349	39 79	29, 777, 806
New Jersey	83, 623	115 51	9, 659, 292	8, 032	120 68	969, 301	95, 221	39 86	3, 789, 507
Pennsylvania	404, 555	96 39	38, 995. 056	14, 902	108 81	1, 621, 486	707, 218	32 39	22, 906, 791
Delaware	17, 587	91 26	1, 604, 989	2, 561	97 47	249, 620	39, 728	28 16	1, 118, 740
Maryland	85, 951	93 15	8, 006, 335	11, 518	103 95	1, 197, 296	115, 623	25, 30	2, 925, 261
Virginia	177, 723	76 41	13, 579, 814	28, 422	92 61	2, 632, 161	276, 775	18 86	5, 219, 976
North Carolina	98, 441	70 20	6, 910, 558	32, 885	81 54	2, 681, 442	287, 062	9 33	2, 679, 288
South Carolina	39, 427	73 17	2, 884, 873	30, 429	84 79	2, 580, 125	151, 657	9 62	1, 458, 940
Georgia	73, 362	70 74	5, 189, 627	64, 956	83 97	5, 454, 356	334, 994	10 77	3, 607, 885
Florida	7, 526	86 21	648, 816	7, 216	108 89	785, 750	174, 161	7 96	1, 376, 321
Alabama	82, 591	72 36	5, 976, 284	79, 301	84 25	6, 681, 109	221, 979	9 91	2, 199, 811
Mississippi	67, 274	61 02	4, 105, 059	69, 176	71 82	4, 968, 220	219, 190	10 40	2, 279, 576
Louisiana	32, 587	59 68	1, 944, 792	52, 133	78 84	4, 110, 165	126, 267	8 66	1, 093, 472
Texas	280, 467	28 16	7, 897, 950	67, 506	41 30	2, 787, 997	2, 408, 903	5 14	12, 381, 761
Arkansas	104, 717	59 40	6, 220, 189	48, 435	61 56	2, 981, 658	138, 001	9 92	1, 368, 969
Tennessee	274, 439	75 33	20, 673, 489	70, 183	66 84	4, 691, 031	208, 771	11 79	2, 461, 410
West Virginia	70, 000	73 17	5, 121, 900	1, 200	104 57	125, 484	200, 000	25 69	5, 138, 000
Kentucky	214, 824	63 75	13, 695, 030	62, 739	78 84	4, 946, 342	341, 695	23 36	7, 981, 995
Missouri	338, 845	52 10	17, 653, 824	70, 136	77 22	5, 415, 901	536, 410	18 92	10, 148, 877
Illinois	651, 262	72 36	47, 125. 318	59, 368	86 13	5, 113, 365	913, 645	24 42	22, 311, 210
Indiana	411, 918	66 96	27, 582, 029	24, 814	77 22	1, 916, 137	484, 861	24 24	11, 753, 030
Ohio	573, 850	74 52	42, 763, 102	22, 228	85 05	1, 890, 491	711, 360	29 58	21, 042, 028
Michigan	206, 071	81 81	16, 858, 668	932	90 18	84, 047	338, 987	28 94	9, 810, 183
Wisconsin	232, 821	103 96	24, 204, 071	2, 492	102 60	255, 679	406, 467	27 31	11, 100, 613
Minnesota	61, 217	90 99	5, 570, 134	993	99 90	99, 200	185, 572	26 78	4, 969, 618
Iowa	429, 038	80 19	34. 404, 557	17, 292	96 39	1, 666, 775	641, 172	22 89	14, 676, 427
Kansas	42, 859	66 52	2, 850, 980	2, 405	80, 73	194, 155	146, 399	21 68	3, 173, 930
Nebraska	16, 130	83 16	1, 341, 370	1, 271	96 66	122, 854	83, 076	26 45	2, 197, 360
Total	5, 756, 940		432, 696, 226	855, 685		66, 415, 769	11, 942, 484		249, 144, 599
Grand average of prices		75 16			77 61			20 86	

F.—*Showing the number, price, and value of the live stock, &c.*—Continued.

States	MILCH COWS AND SHEEP.									Total number of sheep of all ages.	Total value of sheep of all ages.
	Milch cows.			Sheep under one year old.			Sheep over one year old.				
	Number.	Av'rage price.	Value.	Number.	Av'rage price.	Value.	Number.	Av'rage price.	Value.		
Maine	129, 891	$47 91	$6, 223, 077	188, 135	$2 20	$413, 897	564, 407	$2 95	$1, 665, 000	752, 542	$2, 078, 897
New Hampshire	75, 121	47 25	3, 549, 467	132, 466	2 12	280, 827	397, 399	2 70	1, 072, 977	529, 865	1, 353, 804
Vermont	175, 535	48 33	8, 483, 606	260, 516	2 18	567, 924	781, 548	3 00	2, 344, 644	1, 042, 064	2, 912, 568
Massachusetts	133, 479	67 11	8, 957, 775	43, 787	2 18	95, 455	131, 362	3 87	508, 370	175, 149	603, 825
Rhode Island	20, 581	58 33	1, 200, 489	9, 147	2 66	24, 331	27, 441	3 90	107, 019	36, 588	131, 350
Connecticut	131, 143	62 50	8, 196, 437	43, 310	3 00	129, 930	129, 933	4 37	567, 807	173, 243	697, 737
New York	1, 403, 718	52 54	73, 751, 343	1, 249, 223	2 50	3, 123, 057	3, 747, 671	3 48	13, 041, 895	4, 996, 894	16, 164, 952
New Jersey	143, 237	57 22	8, 196, 021	48, 488	3 08	149, 343	145, 464	4 35	632, 768	193, 952	782, 111
Pennsylvania	663, 935	44 94	29, 837, 238	855, 500	2 29	1, 959, 095	2, 566, 502	3 29	8, 443, 791	3, 422, 002	10, 402, 886
Delaware	18, 158	48 66	883, 568	4, 268	2 50	10, 670	12, 804	3 66	46, 862	17, 072	57, 532
Maryland	88, 141	39 90	3, 516, 825	68, 885	3 02	208, 032	206, 657	4 22	872, 092	275, 542	1, 080, 124
Virginia	268, 518	28 11	7, 548, 040	164, 656	1 93	317, 786	493, 968	2 67	1, 318, 894	658, 624	1, 636, 680
North Carolina	203, 555	19 02	3, 871, 616	81, 421	1 15	93, 634	244, 263	1 83	447, 001	325, 684	540, 635
South Carolina	137, 773	18 66	2, 570, 844	44, 966	1 34	60, 254	134, 898	2 05	276, 540	179, 864	336, 794
Georgia	252, 383	21 06	5, 315, 185	78, 718	1 24	97, 610	236, 157	1 87	441, 613	314, 875	539, 223
Florida	82, 777	11 91	985, 874	1, 251	1 55	1, 939	3, 754	2 25	8, 446	5, 005	10, 385
Alabama	170, 982	19 50	3, 334, 149	64, 287	1 11	71, 358	192, 864	1 98	381, 870	257, 151	453, 228
Mississippi	157, 368	19 53	3, 073, 397	48, 240	1 02	49, 204	144, 720	1 69	244, 576	192, 960	293, 780
Louisiana	52, 451	16 00	839, 216	14, 724	87	12, 809	44, 174	1 41	62, 285	58, 898	75, 094
Texas	646, 875	10 29	6, 656, 343	206, 842	1 23	254, 415	620, 529	2 08	1, 290, 700	827, 371	1, 545, 115
Arkansas	108, 111	20 76	2, 244, 384	29, 298	1 82	53, 322	87, 897	2 98	261, 933	117, 195	315, 255
Tennessee	190, 876	25 08	4, 787, 170	66, 010	1 38	91, 093	198, 031	2 01	398, 042	264, 041	489, 135
West Virginia	70, 000	34 87	2, 452, 900	220, 000	1 56	343, 200	660, 000	2 55	1, 683, 000	880, 000	2, 026, 200
Kentucky	149, 353	35 25	5, 264, 693	223, 966	1 85	414, 337	671, 899	2 70	1, 814, 127	895, 865	2, 228, 464
Missouri	306, 527	29 04	8, 901, 544	344, 386	1 53	526, 910	1, 033, 161	2 35	2, 427, 928	1, 377, 547	2, 954, 838
Illinois	544, 920	36 62	19, 954, 970	684, 107	1 64	1, 121, 935	2, 052, 324	2 39	4, 905, 054	2, 736, 431	6, 026, 989
Indiana	422, 883	36 31	15, 354, 881	720, 544	1 41	1, 015, 967	2, 161, 632	2 04	4, 409, 729	2, 882, 176	5, 425, 696
Ohio	704, 506	43 07	30, 343, 070	1, 682, 406	1 81	3, 045, 154	5, 047, 720	2 65	13, 376, 458	6, 730, 126	16, 421, 612
Michigan	265, 850	42 30	11, 245, 455	987, 047	1 81	1, 786, 555	2, 961, 144	2 70	7, 995, 088	3, 948, 191	9, 781, 643
Wisconsin	347, 134	35 82	12, 434, 339	470, 189	1 92	902, 762	1, 410, 569	2 86	4, 034, 227	1, 880, 758	4, 936, 989
Minnesota	132, 669	32 82	4, 354, 196	32, 252	2 03	65, 471	96, 758	2 89	279, 630	129, 010	345, 101
Iowa	372, 722	31 10	11, 591, 654	647, 844	1 58	1, 023, 593	1, 943, 535	2 29	4, 450, 695	2, 591, 379	5, 474, 288
Kansas	89, 461	29 88	2, 673, 094	25, 447	1 50	38, 170	76, 342	2 32	177, 113	101, 789	215, 283
Nebraska	30, 935	35 18	1, 088, 293	5, 514	2 27	12, 516	16, 545	3 45	57, 080	22, 059	69, 596
Total	8, 691, 568	....	319, 681, 153	9, 747, 840	....	18, 362, 555	29, 244, 072	....	80, 045, 254	38, 991, 912	98, 407, 809
Grand average of prices	....	36 78	....	....	1 88	....	....	2 73	....	....	....

F.—*Showing the number, price, and value of the live stock, &c.*—Continued.

States.	HOGS.							
	Under one year old.			Over one year old.			Total number.	Total value.
	Number.	Average price.	Value.	Number.	Average price.	Value.		
Maine	25,293	$8 74	$221,060	8,431	$18 95	$159,767	33,724	$380,827
New Hampshire	21,668	9 66	209,312	7,222	20 00	144,440	28,890	353,752
Vermont	23,346	9 43	220,152	7,782	17 91	139,375	31,128	359,527
Massachusetts	32,401	9 58	310,401	10,800	22 70	245,160	43,201	555,561
Rhode Island	8,679	11 00	95,469	2,893	20 00	57,860	11,572	153,329
Connecticut	37,647	10 00	376,470	12,549	20 00	250,980	50,196	627,450
New York	513,914	6 91	3,551,145	171,304	14 75	2,526,734	685,218	6,077,879
New Jersey	151,695	8 31	1,260,585	50,565	16 73	845,952	202,260	2,106,537
Pennsylvania	792,459	6 29	4,984,567	264,152	12 76	3,370,579	1,056,611	8,355,146
Delaware	31,776	7 00	222,432	10,591	12 00	127,092	42,367	349,524
Maryland	273,512	4 88	1,334,738	91,170	10 22	931,757	364,682	2,266,495
Virginia	728,602	3 66	2,666,683	242,867	7 68	1,865,218	971,469	4,531,901
North Carolina	731,314	2 59	1,894.103	243,771	6 05	1,474,814	975,085	3,368,917
South Carolina	150,444	3 22	484,429	50,148	7 52	377,112	200,592	861,541
Georgia	1,053,714	3 45	3,635,313	351,237	7 75	2,722,086	1,404,951	6,357,399
Florida	68,089	3 16	215,161	22,696	7 41	168,177	90,785	383,338
Alabama	491,535	2 43	1,194,430	163,845	7 86	1,287,821	655,380	2,482.251
Mississippi	403,810	2 88	1,162,972	134,603	6 93	932,798	538.413	2,095,770
Louisiana	122,781	2 25	276,257	40,926	3 75	153,472	163,707	429,729
Texas	826,911	1 61	1,331,326	276,636	3 65	1,005,071	1,102,547	2,337,397
Arkansas	443,597	2 52	1,117,864	147,865	7 18	1,061,670	591,462	2,179,534
Tennessee	1,106,541	2 83	3,131,511	368,846	6 71	2,474,956	1,475,387	5 606,467
West Virginia	225,000	2 00	450,000	75,000	4 87	365,250	300,000	815,250
Kentucky	1,300,156	2 80	3,640,436	433,385	6 31	2,734,659	1,733,541	6,375,095
Missouri	1,320,866	2 35	3,104,035	440,288	5 79	2,549,267	1,761,154	5,653,302
Illinois	1,636,301	3 22	5,268,889	545,433	7 33	3,998,023	2,181,734	9,266,912
Indiana	1,936,027	3 28	6,350,168	645,342	6 84	4,414,139	2,581,369	10,764,307
Ohio	1,604.994	4 11	6,596,525	534,997	8 93	4,777,523	2,139,991	11,374,048
Michigan	313,757	4 27	1,339,742	104,585	9 22	964,273	418,342	2,304,015
Wisconsin	283,917	3 90	1,107,276	94,638	8 59	812,940	378,555	1,920,216
Minnesota	119,049	4 73	563,101	39,683	10 08	400,004	158,732	963,105
Iowa	1,311,640	3 29	4,315,295	437,213	8 21	3,589,518	1,748.853	7,904,813
Kansas	105,497	4 70	495,835	35,165	10 21	359,034	140,662	854,869
Nebraska	41,024	4 50	184,608	13,674	12 10	165,455	54,698	350,063
Total	18,237,956	....	63,312,290	6,079,302	....	47,453,976	24,317,258	110,766,266
Grand average of prices	....	3 47	....	....	7 80	....	....	....

G.—*Table showing the total value of live stock in the following States for the years* 1860, 1867, *and* 1868.

States.	1860.	January, 1867.	January, 1868.
Maine	$15,437,533	$20,540,944	$19,974,806
New Hampshire	10,924,627	13,836,464	12,474,029
Vermont	16,241,989	24,044,396	20,418,952
Massachusetts	12,737,744	18,224,954	19,214,502
Rhode Island	2,042,044	2,920,994	2,869,744
Connecticut	11,311,079	17,572,009	18,699,012
New York	103,856,296	180,039,650	166,557,969
New Jersey	16,134,693	26,877,583	25,502,769
Pennsylvania	69,672,726	115,949,154	112,118,603
Delaware	3,144,706	3,747,696	4,263,973
Maryland	14,667,853	19,344,467	18,992,336
Virginia	35,420,369	34,993,665	35,148,572
North Carolina	31,130,805	22,946,753	20,052,456
South Carolina	23,934,465	13,515,128	10,693,117
Georgia	38,372,734	29,407,415	26,463,675
Florida	5,553,356	4,647,086	4,190,484
Alabama	43,411,711	26,134,639	21,126,832
Mississippi	41,891,692	23,530,710	16,815,802
Louisiana	24,546,940	10,967,091	8,492,468
Texas	42,825,447	38,890,472	33,606,563
Arkansas	22,096,977	14,892,374	15,309,989
Tennessee	60,211,425	41,805,695	38,708,702
West Virginia	12,382,680	....	15,679,734
Kentucky	61,868,237	50,069,931	40,491,619
Missouri	53,693,673	49,972,257	50,728,286
Illinois	72,501,225	115,864,023	109,798,764
Indiana	41,855,539	78,542,074	72,796,080
Ohio	80,384,819	130,137,240	123,834,351
Michigan	23,714,771	56,077,373	50,084,011
Wisconsin	17,807,375	52,235,126	54,851,907
Minnesota	3,642,841	15,400,659	16,301,354
Iowa	22,476,293	74,067,735	75,718,514
Kansas	3,332,450	10,081,590	9,962,311
Nebraska	1,128,771	4,366,352	5,169,536
Pacific States and Territories	48,586,064	55,000,000	60,000,000
Total	1,089,329,915	1,396,648,699	1,337,111,822

H.—*Showing the total number and value of each kind of live stock in the States named in the preceding table in January*, 1868.

	Number.	Value.
Horses	5,756,940	$426,931,267
Mules	855,685	66,104,869
Cattle	20,564,152	565,081,884
Sheep	38,111,418	96,381,609
Hogs	24,317,258	110,866,266
Total value	....	1,165,365,895

CONDITION OF FARM STOCK.

Heavy losses of cattle and horses, and especially of sheep and hogs, were recorded in the report of 1866. Insufficient feed, care, and shelter, in those large sections of the country in which barns do not enter prominently into farm economy, were punished by the sacrifice of millions of money in the value of

this species of farm property. This pecuniary motive for the exercise of greater humanity has not been ineffectual ; a better winter provision for stock has been made in many cases, and the results of superior care have been satisfactory and remunerative. The past winter has also been more favorable to the health of farm animals. The season has been long, uniform in temperature, and not excessively cold ; and these characteristics have been more general than usual throughout the national area, which includes so many varieties of climate and meteorological conditions. In the eastern and northern States hay was generally abundant. In the Ohio valley, between latitude 38° and 40°, the long and severe drought diminished the supply of feed, so that this region of ordinary superabundance of forage was put, for once, to a severe test, and in some places an actual scarcity resulted.

There is yet a lamentable want of buildings and other structures for the comfort of farm animals and economy in their feed and management. There is piety and sense in the suggestion of a correspondent that "a man with any regard to Christianity or his pocket will not allow his cattle to range unprotected in open fields." The necessity for barns, or efficient shelter of some description, in the entire area south and west of Pennsylvania, demands the immediate and urgent consideration of humane and thrifty farmers.

The region of the northern Mississippi and Missouri is far better calculated for grazing and feeding stock than for growing cereals. It combines a healthy climate with a deep, fine, rich soil, and a long summer of high temperature, giving rampant growth to vegetation, succulence, bulk, more straw than grain, more grass than seed, a better growth of green than of white crops; and its capabilities are not improved or its resources utilized by growing grain and ignoring cattle.

In Wisconsin, Minnesota, Iowa, and to a great extent in more eastern States the only barns, with few exceptions, are poles or boards, forming a skeleton frame, covered with heavy masses of straw from the stacks, from the interior of which nearly all light and air are excluded, and in which horses, cattle, and sheep lie upon their filth, until the whole structure is a mass of rotten straw, mold, and reeking dampness. In some cases these rude shelters are arranged with some regard to cleanliness and healthfulness of stock, but most of them are damp, noisome, and repulsive in the extreme. The business of stock raising will never be sufficiently extended or properly remunerative till some attention, some expense, is bestowed upon barns and cattle sheds.

In the south it is a little worse, and only a little, with no barns or shelter whatever. In a good winter, in the lee of fodder stacks, the protection of a forest, or the dryest hummocks of a canebrake, the animal may seek the range in the spring in a medium condition. The attention of southern farmers is called to the urgent necessity for a better provision of forage for horses and cattle. The most disheartening reports of weakness and death from lack of nutrition have been received—in some instances of horses and mules dropping down exhausted in the furrows. The millions lost by such indifference and inefficiency, in the sacrifice of flesh, health, and ability to fatten, are scarcely less than the heavy losses now incurred by actual disease.

CATTLE.

Cattle have been wintered successfully almost without exception in the eastern, western, and northwestern States. Some farmers with short supplies of fodder turned out their stock to spring pasture in lean but healthy condition, and others, whose animals did well through the winter, obliged to seek for them an early bite, observed a falling off in flesh during a season of cool weather and frosty nights.

In western Maryland their condition was "as bad as in 1866–'67 ;" it was poor in many counties in Virginia, and in Norfolk it "was never worse." In many counties of the more southern States it was poor, but, on the whole, no worse,

generally, than usual. In Kentucky winter grasses were injured by the severe drought of the preceding summer. In the following counties of Ohio cattle are reported thin: Seneca, Miami, Jefferson, Butler, Harrison, Fayette, Washington, Madison, Highland, Coshocton, Athens, Hancock, Wayne, Ross, Shelby, and Fairfield. Very little complaint of inferior condition has come from States further west, and almost literally nothing of disease has been reported.

Diseases of cattle.—Exemption from epizoötics and all uncommon maladies of cattle is distinctly announced in a large portion of the counties reported; in the northern States exceptions to this rule are comparatively rare. The diseases most fatal are pleuro-pneumonia, Spanish fever, murrain, distemper, abortion, black leg, &c. Starvation, in some cases, has resulted from the pernicious practice of burning the range, which destroys much of the value of southern vegetation. In Duval county, Florida, a disease vulgarly named "salt-sick," supposed to result from eating plants growing near salt water, has been fatal. In Baker, Florida, an unknown disease has destroyed 2,000 cattle during the past year. A disease, the symptoms of which are not given, caused the loss of 15 per centum of the cattle of Charlton county, Georgia. A disease of the gall, affecting milch cows, occasioned some loss in Washington, Tennessee. Murrains and distempers, without defined characteristics, are reported from various quarters, particularly in North Carolina and South Carolina. While in some localities many herds were starving, in Tompkins, New York, "a few died from overfeeding." The Spanish fever has been less severe than for many years past; in Barton, Georgia, 20 cases are reported, a few in Newton and towns in the same State, and some mortality in Missouri and Kansas. Abortion has occasioned loss of dairy cows in New York and New Jersey. Pleuro-pneumonia is reported from Baltimore, Maryland, and Montgomery, York, and other counties in Pennsylvania; from Hudson, New Jersey, introduced from New York city. A correspondent thus describes the disease in Baltimore county:

The disease has baffled all medical skill, and thus far remedies have proved unavailing. It is probably pleuro-pneumonia, or identical with it. Heavy losses of valuable cows have taken place in a number of stables—a loss of 14 in one stable; in another, 20; in another a loss of 35 is reported out of 38; in another, a loss of 30 out of 70; in many other stables the losses are in proportion. This same disease prevailed one year ago in this locality, and was then called "lung disease," but is now universally conceded to be pleuro-pneumonia. The animal, when attacked, becomes exceedingly sluggish and low-spirited; appears to be not in much pain; refuses food; the secretion of milk ceases from the day the animal is attacked; death follows in from five to ten days, the mortality being almost universal. An animal which is discovered to be affected with the disease should be at once removed from the herd, as the disease spreads rapidly by contact.

SHEEP.

Sheep have wintered far more successfully than in 1866–'67. The more marked exceptions reported are the following counties:

Maine.—Kennebec.

New York.—Chautauqua, Washington, Suffolk, and Seneca.

Pennsylvania.—Dauphin, Erie, Armstrong, Susquehanna, and Huntingdon.

Maryland.—Anne Arundel.

Virginia.—Lee, Gloucester, Madison, Tazewell, Scott, Patrick.

North Carolina.—Harnett, Bertie, Mecklenburg, Guilford, Perquimans, Greene, Hertford, Richland.

South Carolina.—Columbia.

Georgia.—Chattooga, Merriwether, Johnson, Catoosa, Morgan.

Florida.—Levy.

Mississippi.—Yazoo, Amite, Marion, Madison.

Louisiana.—Avoyelles, Plaquemine.

Texas.—Harris, Hays, Navarro, Dallas, Blanco.

Tennessee.—Meigs, Sevier, Shelby, Fayette, Davidson.

Kentucky.—Owsley, Carroll, Boone, Rockcastle, Anderson, Franklin, Henry.

West Virginia.—Jefferson, Wood, Putnam, and Lewis.

Ohio.—Holmes, Seneca, Miami, Jefferson, Erie, Butler, Clinton, Geauga, Harrison, Washington, Madison, Highland, Tuscarawas, Coshocton, Athens, Monroe, Hancock, Wayne, Ross, Perry, Shelby, Muskingum, Carroll, and Fairfield.

Indiana.—Brown, Jefferson, Pike, Porter, Perry.

Illinois.—Crawford, Cumberland, Iroquois, Lee, Grundy, Pope.

Missouri.—Osage, Carter, Phelps, Clark.

Iowa.—Warren, Kossuth, Montgomery.

Wisconsin.—Columbia.

Diseases of Sheep.—The losses from disease have been greater among sheep than cattle, due mainly to the want of care and feed, and to some extent apparently to constitutional debility induced by fine-wool breeding. Grub in the head, liver rot, scab and foot-rot, are too common in all parts of the country. In New York, Ohio, and Texas, disease appears to be more prevalent than elsewhere; in the latter State scab and foot-rot producing most of the loss. In Livingston, New York, one-eighth of the total number are estimated to be suffering from the foot-rot. The Onondaga correspondent says, with some show of probability, that "where a lazy farmer's flock becomes infected they are sure to have it always, though it can be cured."

In Beaver, Pennsylvania, an unknown disease has caused much loss. One man lost 100 from a flock of 330, partly from grub in the head, but mostly from the malady referred to, the animals falling into a kind of stupor, *post mortem* examination showing the intestines lumpy or knotty. The flock was well kept. Another wool-grower lost 80 from a flock of 275, and another 200 from a flock of 800; the latter from scab and foot-rot, probably intensified by over-crowding in winter.

The loss in Athens county, Ohio, was 25 per cent. Feed becoming deficient they were turned out too early and died from starvation and exposure. In Medina the poorest were culled out and killed for their pelts, thus avoiding a greater loss than six or seven per cent. The loss is estimated at 25 per cent. in Middlesex, Virginia, from exposure. Texas appears to have lost more than other States. Not more than fifty counties in the United States report heavier losses than those of the preceding year.

HORSES.

Less than the usual amount of diseases in horses is reported. The contagious diseases so prevalent during the war have disappeared in a great measure. In Alabama and Tennessee horses and mules have died from "eating bad corn" brought down the river. Glanders is reported in Allegheny and Washington, Maryland; in Nelson and Smythe, Virginia; in Onslow and Craven, North Carolina; in Talbot, Georgia; in Hickman, Tennessee; in Lamar, Texas; in Avoyelles and Carroll parishes, Louisiana; in Rockcastle, Kentucky; in Oktibbeha, Mississippi.

In Gates, North Carolina, a loss of 20 per centum from blind staggers is chronicled; in Onslow and Craven, in the same State, heavy losses resulted from the same cause; also in Georgetown district, South Carolina; and in Emanuel, Benton, and Crawford, Georgia, the same disease has prevailed to an alarming extent.

In Sampson, Currituck, and other counties in North Carolina, a disease known as "sleepy staggers" carried off many horses and mules in the months of August, September, and October. This form of disease is common in the tide-water counties, and is evidently induced by malaria. Mules escape it better than horses. Eight or ten per cent. of the horses of the county have fallen by this disease. Our Craven (N. C.) correspondent states that staggers among horses, and fever and ague among the people, have not prevailed since 1855, until 1867; that they are apt to come together only in the autumnal months, and probably arise from the same causes. Horses are more subject to staggers than mules, and nineteen-twentieths of those attacked die.

In Perquimans, North Carolina, a fatal disease is described by local surgeons as apoplexy. It is also attributed to malaria.

Lung fever has occasioned some loss in Jefferson, York, and Bucks, Pennsylvania. Inflammation of lungs and bowels have been fatal in Livingston, Michigan. In Westchester county, New York, "a great number of horses were taken very suddenly with loss of appetite, shivering, and swelling in the throat, which generally proved fatal in two or three days. The horse doctors could do nothing for it; some of them considered it a sort of diphtheria. Whatever it was, not one taken with it survived."

A very malignant disease, known as charbon, said to have been of French origin, has been very destructive to horses and mules in the southwest. At least 250 of these animals perished from it in Desha county, Arkansas. A swelling first appears generally on the neck and shoulders, sometimes on the flank, which enlarges rapidly, attended with high fever, but not with loss of appetite, resulting almost inevitably in death, sometimes in 12 hours, in some cases five or six days, though generally only one or two days.

In Florida horses have been generally healthy. It is said that they sometimes "become *sanded*, by feeding where the grass is short, but are easily relieved by physic, if seasonably given."

In Arkansas, buffalo gnats have been troublesome, frequently causing death, by the animal inhaling large quantities.

A very fatal disease broke out among the cavalry horses of Austin and San Antonio, causing a loss of 10 per cent. in the horses of that vicinity. It spread through the range of the adjoining counties, and in Williamson county occasioned a loss of 20 per cent. of the one and two year old colts. Not more than one-half of the number attacked recovered, and it was found that those surviving would not live through the winter. No remedy has been found. First, the animal droops, then a hard swelling appears between the fore legs, sometimes as large as a man's head, which seldom breaks, but in some cases discharges a yellow, bloody liquid. After 10 days, if the animal recovers, the swelling dries up and becomes honey-combed, and small white substances protrude an eighth of an inch, sometimes to the number of 50 on six inches square.

"Distempers," of uncertified and probably various characteristics, have prevailed locally in many of the southern States; and jaundice, gleet, farcy, and other diseases have been noticed to a limited extent.

HOGS.

The losses from hog cholera, ordinarily not less than $15,000,000 per annum, and greater, probably, than the damage by all diseases to any other kind of domestic animals, have been less the past year than for several previous seasons, yet so destructive as to cause a general despondency among swine breeders, to interrupt the prosperity of the surest corn-growing sections, and increase the cost of living to consumers of ham and bacon. In every direction, calls for a remedy are made, but they cannot be satisfactorily met. No remedy is likely to be found, as in the case of rinderpest in the cattle of Europe; but veterinary science, if such a science exists in this country, should do something in devising means of prevention. It is important in its influence upon the health of the human family. It cannot be possible that the flesh of those hogs which partially recover is fit for human food; and yet it goes into consumption in some form. In Franklin, Kentucky, our reporter says that "the sickness of several persons, it is thought, resulted during the winter from eating diseased pork; no death ensued, and no investigation was made." Our correspondent in Cherokee, Georgia, seems to believe, and the reader will doubtless agree with him, that something is the matter with the hogs of that county, when he says that "they can be fattened, but have all through the meat something like fish eggs, full of corruption."

An enumeration of losses cannot be attempted in detail. Ten per cent. of

the entire stock is not unfrequent; many instances of losses of 15 or 20 per cent. might be given; in Tippah, Mississippi, and Nelson, Virginia, 25 per cent.; in Calhoun, Alabama, one-third; in "some localities" of Martin, Indiana, one-third; in Craig, Virginia, and Morgan, Georgia, 50 per cent.; in parts of Chatham, North Carolina, three-fourths of the stock; in Anderson, Kentucky, "1,000 hogs, without including pigs;" in Union parish, Louisiana, the damage was "slight—1,000 head;" in Wood, West Virginia, several farmers lost all.

SUGAR PRODUCTION IN LOUISIANA.

While cane sugar may be grown on any portion of the Mexican gulf coast, and great expectations are entertained of cane culture in Florida, southern Georgia, and parts of Texas, hitherto the production of sugar in this country has been undertaken mainly within the limits of Louisiana, on the alluvial soils of the Mississippi. The following will illustrate the predominance of that State in this respect:

Table showing the quantity of cane sugar and molasses produced from crop of 1859, as reported in United States census.

States.	Sugar.	Molasses.
	Hhds., 1,000 lbs. each.	*Gallons.*
Alabama	175	85,115
Florida	1,669	436,357
Georgia	1,167	546,749
Louisiana	221,726	13,439,772
Mississippi	506	10,016
Missouri	402	22,305
North Carolina	38	12,494
South Carolina	198	....
Tennessee	2	2,830
Texas	5,099	408,358
Total	230,982	14,963,996

A complete statement of crop of sugar and molasses, made from actual canvassing, of every plantation in Louisiana, was prepared annually for many years by P. A. Champonier, including the name of every proprietor, location of plantation, and the yield of each. From these records the following results of the operations of 12 years, from 1849 to 1860, inclusive, are prepared:

Years.	No. of sugar-houses.	No. by steam-power.	No. by horse-power.	No. hhds. of sugar.	No. pounds of sugar.	No. gallons of molasses.
1849	1,536	865	671	247,923	269,769,000	12,000,000
1850	1,495	907	588	211,203	231,194,000	10,500,000
1851	1,474	914	560	236,547	257,138,000	18,300,000
1852	1,481	943	538	321,934	368,129,000	25,700,000
1853	1,437	956	481	449,324	495,156,000	31,000,000
1854	1,338	948	390	346,635	385,726,000	23,113,620
1855	1,299	938	361	231,427	254,569,000	15,274,140
1856	1,299	938	361	73,976	81,373,000	4,882,380
1857	1,294	935	359	279,697	307,666,700	19,578,790
1858	1,298	987	311	362,296	414,796,000	24,887,760
1859	1,308	992	316	221,840	255,115,750	17,858,100
1860	1,292	1,009	283	228,753	263,065,000	18,414,550

We have no means of giving, with approximate accuracy, statements of the crops of 1862 and 1863, during the disturbances of war.

1864.

Parish.	Hhds.	Parish.	Hhds.
Orleans	26	Ascension	1,285
St. Bernard	361	Iberville	429
Plaquemine	2,301	Jefferson	303
Terre Bonne	426	St. Mary's	61
Assumption	963	Point Coupee	4
La Fourche	118	West Baton Rouge	35
St. Charles	73	East Baton Rouge	60
St. John the Baptist	43		
St. James	267	Total	6,755

This was the quantity produced within the military lines; adding Rapides parish, the product of the State might be placed at 7,100 hogsheads.

Total number of plantations on which sugar was made this season, 174; in 1861 there were 1,291 under cultivation, producing 459,419 hogsheads.

1865.

Parish.	Hhds.	Parish.	Hhds.
Orleans and St. Bernard	1,024	St. Charles	21
Plaquemine	4.217	St. John the Baptist	386
Terre Bonne	1,474	Rapides	795
Assumption	1,391	Point Coupee	60
La Fourche Interior	407	West Baton Rouge	60
Ascension	1,839	St. Martin	150
Iberville	420		
Jefferson	704	Total	13,913
St. James	965		

1866.

Parish.	Hhds.	Parish.	Hhds.
Orleans	153	St. John the Baptist	1,501
St. Bernard	1,158	St. Charles	1,529
Plaquemine	6,509	Jefferson	2,251
West Baton Rouge	125	La Fourche Interior	3,150
East Baton Rouge	388	St. Mary	560
Terre Bonne	4,191	Vermillion	75
Assumption	5,999	St. Martin	158
Iberville	2,274	Rapides	630
Ascension	2,774		
St. James	4,802	Total	38,227

Shipments from plantations up the river would probably increase the product to about 40,000 hogsheads.

The crop of 1867 was somewhat larger than that of 1866.

RELATIVE VALUE OF LANDS OF THE UNITED STATES.

In the schedules of "Special statistics of farm resources and products," sent to the Department corps of statistical correspondents, from which very complete returns were made on a number of important subjects, occurred the following items:

1. What is the average percentage of increase (or decrease, if cases of decrease exist) in the price of farm lands in your county since 1860?

2. What is the average value of wild or unimproved tracts of land; and what is the character, quality, and capabilities of such land?

The returns upon these points were quite too extended and voluminous for elaboration in this report. A condensation was published in several numbers of the monthly, and an epitome, giving some of the essential features of this information, is herewith presented.

CHANGE IN FARM VALUES.

In some sections of Maine farms have been thrown upon the market from the scarcity of farm labor, with high rates of wages, tending to divert investments from agriculture.

It is noted in New Hampshire that the growth of manufacturing has rendered farm property more valuable in its immediate vicinity, and, to some extent, in more remote localities, yet this influence is partially counterbalanced by the enlarged demand for labor in manufacturing towns, which makes it so difficult to be procured in the country, discourages the severely worked farmer, and causes him to sell his place and leave his business. The prices of agricultural products are sufficiently high to stimulate effort and pay for hired labor, but many farm proprietors in New England are advanced in age, their sons having left them, and have neither the energy nor inclination to enlarge operations and increase expenses, hence their lands are offered for sale, and the competition tends to reduce prices. The difficulty was augmented in 1865–'66 by a spasmodic revival of manufacturing, which made a sudden and heavy draft upon both agricultural and household labor, rendering the needed supply so dear and difficult, for the time being, as to drive many from the homestead, and work a temporary reduction of values.

The influence of the manufactories in turn enhanced the value of farm products by increasing the demand for them, tending to sustain the otherwise drooping prices of real estate. While these causes of fluctuation were operating, and in a measure neutralizing the proper influence of each, the alluring west was constantly enticing away the energetic and ambitious, and withdrawing capital and labor. This accounts for the fact that in New Hampshire, and some other States of this section, the value of lands has not appreciated in the same degree as gold. Nor is such a result to be expected. Real estate did not rise *pari passu* with gold, nor fluctuate with its quotations in the market; neither will such property fall with the descent of that representative of value, though it will sympathize with the decline.

In Vermont a marked difference in relative values is noticed in favor of those counties in which sheep breeding flourishes. The range of increase is from 10 to 30 per cent., the latter rate representing the comparative status of Addison, which has gained a reputation throughout the country for the skill and success of its breeders of improved Merino sheep. While the recent depression in the wool interest has been felt there, a harvest had previously been gathered which filled the country with comparative plenty, encouraged improvement, and tended to retard emigration.

The returns from Massachusetts are instructive. The largest appreciation is in Berkshire, 50 per cent., or an actual increase on a gold basis, due to the pure

air and fine scenery of that locality, in connection with the growth of a taste for rural life in the residents of the cities of New England and New York, and a more general ability to cultivate it. The improvements resulting have not only stimulated prices, but have aroused a spirit of progress which must result in larger production and more comfortable living. Another noticeable feature in the returns is a remarkable advance in the vicinity of towns, arising from their rapid growth since 1863, a peculiarity which may be considered general throughout the States. This is a fact to be regretted, so far as it arises less from legitimate enlargement of manufacturing and commercial business than from a disposition to live at ease, upon gains too suddenly or easily made, or to avoid the honest labor of a producer, and secure a living by some expedient involving little effort.

A wide range of appreciation in prices is observed in Rhode Island, from 7 per cent. in Washington county to 33 in Newport. At eligible points along the bay coast, and in the vicinity of Newport and other towns, very high prices have been paid by wealthy gentlemen for country seats, or for amateur or fancy farming, the prices being limited by the demands of the seller or the wealth of the purchaser.

In Windham county, Connecticut, prices are said to have varied little in 50 years. Other agricultural districts have a very quiet real estate market. In the neighborhood of manufacturing villages a considerable advance is noted, as is seen in every State in which manufacturing flourishes. The average for the State is 20 per cent. nominal appreciation.

The average increase in the value of New York farms, upon the basis of thirty-two counties reported, is 28 per cent. This is not quite equal to the rise in gold; no increase was observed until gold commanded a high premium, and little if any decline was produced by the tumble of metallic currency in 1865; nor would a resumption of specie payments bring down farm values to the rates of 1860. This average of 28 per cent., therefore, in view of all the causes affecting values of real property, may be estimated to indicate an *actual* appreciation at the present time of say 15 per cent. since 1860. The tendency to gather in towns is strong in this State as elsewhere. It may be mentioned here that similar facts exist in Europe, causing at present in France much loss to production, and no little anxiety for the bread supply and the real welfare of the whole population.

Under-draining, stock-feeding, and similar features of progressive agricultural practice are mentioned as causes of enhanced values in several counties; in Seneca activity in farm investments is attributed to such causes. In these localities the hay and grass crops are favorite sources of income. Some farms have been very much improved by turning off the little creeks on the high lands for the purpose of irrigating, and the low lands are bettered by under-draining.

Farm valuations in New Jersey have been locally affected by a variety of circumstances. Railroad improvements have caused rapid advances, as in Union, 100 per cent. along the line, the county averaging 50, and in Gloucester and other counties; and they have brought thousands of acres into cultivation which promise large results in cranberries and other fruits, and in a variety of vegetables for city markets. In the eastern and southern portions of Hudson, farms have been cut up into villa sites and sold for $1,000, $2,000, and even $3,000 per acre. Large tracts in Cumberland and Atlantic, hitherto practically valueless, have been brought under cultivation and greatly increased in value. A general advance has been realized in the vicinity of towns, as a result of the extension of fruit-growing and market-gardening.

The average increase in Pennsylvania may be placed at 25 per cent. But two or three counties report no advance. The eastern counties indicate a greater appreciation than the western. Lycoming reports as high as 100 per cent. advance; Susquehanna, Luzerne, Lancaster, Cumberland, Clearfield, Erie, and Lawrence, from 40 to 50 per cent.; Wayne, Wyoming, Bradford, Tioga, Colum-

bia, Union, Berks, Perry, York, Delaware, Franklin, Cambria, Westmoreland, Somerset, Beaver, Armstrong, and Warren, from 25 to 35 per cent.; Crawford, Allegheny, Dauphin, Juniata, and Bucks, from 15 to 20 per cent.; McKean, Washington, and others from 2 to 15 per cent.

The improvement in selling rates of Delaware lands has been remarkable. Kent and Sussex counties have increased fully 100 per cent., in consequence of the impetus given to the sale of low-priced lands by the immigration invited by the railroad facilities recently obtained. The upward tendency still continues, and may be taken as an earnest of what may be expected in the more southern States within the next five years.

Of the counties of Maryland from which returns have been received, Allegheny, in the extreme west, reports an advance of 50 per cent. in the value of farm lands as compared with the census estimates of 1860, and the adjoining county of Washington about 33 per cent.; Baltimore county 35 per cent.; Montgomery, Cecil, and Talbot, about 30 per cent.; Harford, 20 per cent.; Kent, 10 per cent.; Queen Anne and Anne Arundel, no advance; while St. Mary's shows a decline of about 25 per cent. Along the proposed line of the Metropolitan branch of the Baltimore and Ohio railroad, in Montgomery county, lands have advanced 25 per cent. more than in other portions of the county, while the rich bottom lands along the Potomac have decreased in value from the difficulty in procuring labor to work them. In Queen Anne the prices are reported considerably lower than in 1864-'65.

Two-thirds of the counties of Virginia report a decrease in the value of land since 1860, ranging from 10 to 60 per cent., and averaging 35; the remainder, with two or three exceptions, make the present price in currency no greater than the valuation in 1860. An average decrease for the entire State may be placed at 27 per cent. This makes the depreciation, in comparison with the date of the last census, about the same percentage as the appreciation which was reported in New York—that is, property worth $100 in 1860 is now valued at $73 in Virginia and $128 in New York. Yet this reduction is more apparent than real; at least it is not permanent, and is far less marked to-day than it was a year ago. Very few sales were made at prevailing prices; yet such has been the dearth of money, and almost everything except land, that more frequent sales—apparent sacrifices—would have been better for the people. Those who are able to hold their land, and many who are not, refuse to sell at less than former prices; still there are thousands of farms or uncultivated tracts of land that can now be bought for less than their intrinsic worth; and there are opportunities at forced sales, or under stress of immediate want, to obtain valuable property for a trifling consideration. In a portion of Loudon, especially the Potomac and Loudon valley, and Clarke county adjoining, prices are already higher in consequence of northern immigration than in 1860; and such will be the result throughout the State when farms are subdivided and occupied by an enterprising people.

The causes of depreciation assigned are numerous: first of all is the want of labor, which is universally noticed; the lack of capital; the large amount of land offered for sale to reduce the size of farms; State enactments, forbidding a higher rate of interest than six per cent., tending to drive capital to cities and out of the State; the stay law; neglect of agriculture; and, finally, reconstruction not in accordance with the judgment or prejudices of reporters. In many sections there is a prevalent disposition to sell all surplus area of farms above 100 to 200 acres.

Advance in price is noticed in many counties. In Middlesex, on the Rappahannock, land that could have been purchased two years ago for $10, will now command $30. In Pulaski, in the southwest part of the State, while the decline, as shown by the few sales made, is 60 per cent., holders generally are not disposed to sell at less than former rates. This is the fact to a great extent through-

out the State, and it gives a wide range to prices, and makes an estimate of an average a very difficult undertaking. The prices are made by the necessities of the sellers.

In 1860, a portion of the Shenandoah valley, a part of the eastern slope of the Blue Ridge, the James river region, and some other sections, were cultivated, improved, highly valued, and prosperous. Jefferson county averaged $52 per acre, by the official assessment, and probably $80 by real valuation, while the average assessed value of Ohio farms was but $26. Loudon, with 220,266 acres improved, and 75,876 unimproved, was valued at $10,508,211. Mountainous sections, the upper portion of the valley of Virginia, the tide-water region, and the western slopes of the Alleghanies, were less valuable, ranging from $5 to $30, and much higher with valuable improvements, according to location and all the various circumstances which usually affect prices. Farms at $100 per acre, and even $150, were often purchased, and the same prices will soon be reached when losses of population and property have been repaired.

Reports from 41 counties in North Carolina represent a very general decrease in values of real estate. Madison and McDowell report no decrease from prices of 1860, while the latter shows an actual increase on those of 1866. Onslow reports no decrease on well-improved farms, but all others estimate a decline varying from 5 to 75 per cent., and even more, especially at forced sales. As a general rule, small and improved farms have decreased less than large and neglected ones. The general average may be fairly rated at about 50 per cent. The causes are variously stated as war, change in system of labor, scarcity of money, unsettled state of public affairs, and the unrest of doubts regarding the future.

Returns represent the decrease of real estate in South Carolina to be from 25 to 80 per cent., making the average for the State about 60 per cent. The causes are variously stated: general indebtedness, scarcity of money, want of reliable laborers, great loss of capital in slaves, want of capital, unsettled condition of the country, general poverty of the people, fear of confiscation, and negro dominion.

Returns to our circulars from about 50 counties of Georgia show an average decline of from 50 to 60 per cent. in the value of farm lands, as compared with the estimates under the census of 1860. No county gives an actual increase; but Union, Fulton, and Charlton show no change in value since the date named. A few counties report a very large decline—from 80 to 90 per cent., but the major portion range from 40 to 60 per cent. The depreciation of these lands is, of course, attributable to the same causes which have similarly affected all the southern States, and the estimated values are but nominal, sales being few at any price, except when forced.

The depreciation in Florida is placed at 55 per cent.; the northern tier of counties, 75 per cent.; Liberty and Alachua, 50; Duval, 20; while an increase of 33 per cent. is shown along the St. John's river, where northern settlers have established themselves and made improvements. In a few counties where squatters "settle in the woods, put up a log house, clear a small tract and plant it for a few years, and when it begins to get poor move into the woods again," there is too little agricultural life to be affected by war or emancipation, and the price of lands remains as in 1860.

Alabama has suffered an average depreciation of 60 per cent. The rate of decline, to a certain extent, is varied by the size of the farms, the smaller holdings bearing higher prices, sometimes equal to a difference of 50 per cent. In Marengo county, the region of the "cane-brake" lands, which are scarcely surpassed in the United States for fertility, ease of culture, and enduring productiveness, the fall in prices has been 66 per cent.

In some of the counties of Mississippi, one year ago, farm lands could be sold for three-fourths of their value in 1860, but the financial distress consequent upon

the fall of cotton prices threw a large amount of land upon the market which must be disposed of at forced sale, having been mortgaged for supplies. Along the central tier of counties the decrease is 75 per cent.; Lauderdale, 70 to 80: Winston, 66 to 75; Attala, 66; Leake, 50; Washington, 75; Yazoo, 66; Madison, 60 to 70; Hinds, 75, with few sales at any price. In Pike county, in the south, bordering on Louisiana, farming lands have fallen in value 50 per cent., except those adjacent to railroads, while in the adjoining county of Marion the decrease is set down at 75 per cent. The average depreciation throughout the State is 65 per cent.

The depreciation has been very great in Louisiana, averaging 70 per cent., and ranging in the several parishes from 33 to 90, the latter in Tensas and Concordia, with no demand, few sales, and little money with which to purchase. The desolation is well shown by two examples. Our Tensas correspondent writes:

Within a year two of the most valuable estates have been assessed by order of the court, (the owner having deceased,) and the value placed on land, with every necessary improvement, was $5 per acre for the cleared, and $10 per acre for the portion in timber. In 1859 about 400 acres of one of these places were sold at $125 per acre, and $18,000 in cash paid upon it, but within the past 12 months the purchaser obtained a release of the purchase by forfeiting this payment. During 1860, when the levees were intact, these same lands could not have been purchased for $130 per acre, and would readily have commanded that price at public sale. At this time the value of land is only nominal, and commands no stated price.

Our Rapides correspondent says:

Well-improved sugar and cotton plantations have no fixed price; few sales; no persons here able to buy, nearly all desiring to sell. Hundreds of thousands of well-improved acres are now lying idle, there being no labor for them. The richest lands (no levees needed) are growing up in weeds, trees, &c. On my own plantation, where I have made over 1,000 hogsheads of sugar, 2,500 barrels of molasses, 15,000 bushels of corn, with hay, &c., with pastures for 500 head of horned cattle, large flocks of sheep and hogs, mares and colts, I have this year less than 200 hogsheads of sugar and but little corn; stock of cattle, sheep, hogs, mares, and colts, all gone, destroyed during the war.

Texas was less injuriously affected by the war than any other southern State. The decline in the prices of real estate has been far less marked than in sections desolated by contending armies, and preyed upon by civil and military authorities demanding forced loans. The average decline is about 28 per cent. Anderson and Victoria counties have shared deeply the general depression of the gulf-coast region, indicating a loss of 70 per cent.; Dallas, Falls, Nacogdoches, Goliad, Blanco, De Witt, Colorado, and Lavacca, are placed at 50 per cent.; Collin, Cherokee, Hardin, and others, 25 to 33; Houston and Navarro, 25; others somewhat less: Bell, Gillespie, Lampasas, Burnet, Nueces, and Cameron report no change, while Washington, Hays, and Coryell show an increase of 5 to 10 per cent. In Cameron the original Mexican grants of 4,500 acres having a river frontage on the Rio Grande of only 1,000 yards have been subdivided and are held in lots of not exceeding 10 to 15 yards river frontage, with a depth of 15 miles. A person buying 300 to 400 yards frontage must purchase from 1,500 to 2,000 acres.

The average depreciation of Arkansas is 55 per cent. Occasionally farms have been sold for the most insufficient consideration, under compulsion of debt and desperation, and forced sales are often made at the creditors' own prices.

Tennessee shows a wide range of depreciation, from 5 or 10 per cent. to 50; the average is about 18. The heaviest decrease is reported from Davidson and Henry counties, being about 50 per cent.; though the former reports few sales at reduced rates, unless under compulsion, while in the latter the decline is attributed to "the dilapidated condition of houses and fencing, and the wild growths consequent upon the war, together with high taxes," &c. Weakley and Meigs, 40 per cent. decline; Rhea and Lincoln, 33; Haywood, 30; Hawkins, Monroe, Polk, Coffee, Perry, 20; Hickman, 16; Bledsoe and Giles, 10; Greene, 3 to 5; while Williamson, Union, and McNairy remain at about the same figures

as in 1860; Montgomery reports 2 per cent. increase; Sevier and Campbell, 10 per cent.; and Marion from 10 to 15 per cent. The great bulk of land in Rhea county for the last 50 years has been in the hands of a few owners, and it increases in prices when there is little tax to be paid, and decreases when the taxes are greater; hence the present decline. The same general causes, however, which have tended to depreciate real estate, and particularly farm lands, in the southern States, have operated in Tennessee, though not to the same extent, nor is it probable that a return to former values will be so long delayed, there being less necessity to sacrifice, and not so strong a disposition to sell at any price.

Coming up from the seceded States, a slight nominal appreciation is shown in Kentucky—about 10 per cent. In the immediate vicinity of Louisville 100 per cent. is claimed; Kenton, Pendleton and Boone, 40 to 50 per cent.; Anderson, 33; Lewis and Rockcastle, 30; Edmonston, 25; many others a slight advance; and Hardin 25 per cent., and Spencer 15 per cent., decline.

Unlike Virginia and the other States in the south in which the involuntary labor system existed, West Virginia shows an increase in the value of lands since 1860, amounting to an average of 32 per cent. There is some difference in this appreciation in different parts of the State, the Pan Handle and Ohio river counties being generally above the average. Hancock, Tyler, Webster and Wood are placed at 50 per cent. Nicholas, Grant, Cabell and Mineral are the only counties returned at rates less than those of 1860. While the actual product of oil has been increased since 1865, wild speculation has subsided, and lands in this vicinity, except those known to be oil-bearing, now average about 5 per cent. increase over prices of the period first mentioned.

With but two exceptions, all the counties of Ohio making returns report an advance in the value of farm lands since 1860, the general average showing an increase of from 30 to 35 per cent., as compared with the last census. Hardin county, in the interior, and Ottawa, on Lake Erie, report an increase of 100 per cent.; Lorain and Jefferson, 75 per cent.; Athens, 60; Lucas, Hancock, Sandusky, Licking, Tuscarawas and Highland, 50; Wood, Warren, Erie, Columbiana, 40; Clarke, Greene, Medina, Fairfield, Wayne, Carroll, Holmes, Jackson and Fayette, from 30 to 35; Williams, Fulton, Henry, Mercer, Butler, Ashland, Marion, Union, Geauga, Wayne, Starke, Morgan, Vinton, Lawrence, Ross, from 20 to 25; Logan, Seneca, Portage and Washington, 15 per cent.

Indiana shows an increase in the value of lands in a majority of the counties reported, averaging 27 per cent. In some parts of Brown the increase has been 100, and in Warren and White, 75 per cent.; in Carroll and Switzerland, 50 per cent. up to 1864, and since that date a decrease of 20 and 30 per cent. De Kalb, until 1864, was about the same as in 1860, but now shows an increase of 25 per cent. Steuben, the northeastern county of the State, without railroad advantages, makes an increase of 20 per cent., with a steady upward tendency. Howard, Jasper, Jennings and Washington, show no increase.

The average increase in the value of farm lands in the several counties of Illinois, as compared with the estimates under the census of 1860, is variously returned by our correspondents ranging from 6 per cent. in Lake county, on Lake Michigan, up to 100 per cent. in Ford, DeWitt, Moultrie, Richland, Clinton, St. Clair, and Union. In Will, Grundy, Fulton, Christian, Macon, Pope, the advance is 70 to 75 per cent.; Rock Island, Knox, and Stephenson, 60 to 65 per cent; Winnebago, Henry, Warren, Douglas, Logan, Sangamon, Jersey, Fayette, Effingham, Cumberland, Cook, Wabash, Marion, and Washington, 40 to 50 per cent.; McHenry, Lee, Mercer, McDonald, Stark, Morgan, Crawford, Randolph, Alexander, and Massac, 30 to 35 per cent.; Madison, Macoupin, Pulaski, and Hardin, 25 per cent.; Kane, Bureau, Henderson, Woodford, Iroquois, Edgar, 15 to 20 per cent.; Livingston, Adams, and Franklin, 10 per cent. Edgar county makes an increase of 30 per cent. up to 1864, but since that

date a decline to 15 per cent. Moultrie shows a similar decline since 1863, though the general advance since 1860 is put at 100 per cent.; while Richland reports that its increase of 100 per cent. has been made chiefly since 1863. The general increase for the whole State may be set down at from 40 to 45 per cent.

Of the counties of Michigan making returns to our circular, but one, Ontonagon, reports a decline in the value of farm lands, depreciation in this case being attributed to the great depression in the copper mining interest. Bay county claims an increase of 300 per cent.; Iosco, Alpena and Gratiot, from 200 to 250; Delta, Leelenaw, Cass, Clinton, and Jackson, 100; Kent, 66; Lapeer, Ingham, Barry, Branch, Ottawa, and Muskegon, 50; Berrien, Van Buren, Macomb, St. Joseph, 30 to 40; Alcona, Livingston, Hillsdale, and Kalamazoo, 15 to 25 per cent.; showing an average increase of about 70 per cent. for the State since the estimate of 1860. Mason county has been mostly settled under the homestead laws since 1862, and farm lands have increased from $1 25 to $10 per acre.

On the basis of the county returns received from Wisconsin, the average increase of the value of farm lands in the State since 1860 may be estimated at from 45 to 50 per cent.; but one county reporting "no advance" since that date. Sauk county, the great hop district, shows the largest increase—lands averaging $6 per acre in 1860 being now held at $35 per acre, an advance of nearly 500 per cent. Calumet, on the eastern border of Winnebago lake, reports an increase of 150 per cent.; Chippewa and Marathon, in the northern part of the State, La Crosse, in the western, and Green lake in the central part, 100 per cent.; Pierce, Trempeleau, 60 per cent.; Clark, Buffalo, Jackson, Washington, Brown, Outagamie, 50 per cent.; Ozaukee, 40 per cent.; Vernon, Rock, Lafayette, Walworth, Fond du Lac, 30 to 35 per cent.; Monroe, Richland, Crawford, Greene, Racine, Portage, Columbia, and Marquette, 20 to 25 per cent.; Kenosha, 15 per cent.; Winnebago, 10 per cent., and St. Croix, 5 per cent.; Douglas alone reporting "no change."

Returns from about 25 counties of the more thickly settled portions of Minnesota indicate an average increase of at least 100 per cent. in the value of farm lands in the surveyed districts, as compared with the census of 1860. The territory embracing nearly the whole upper half and a portion of the southwestern counties of the State has not yet been surveyed and put in market by the government, and is uninhabited or settled only by Indians and traders, and is not, of course, considered in making up the average increase. No county reports an active decrease in value of farm lands, though Morrison, sparsely settled, and Cass, just coming into market, report no change in price since 1860; and Ramsey, in which the capital of the State is located, and where lands were held very high at that date, reports little, if any, advance. Brown, Nicollet, and Watonwan, claim an increase of 300 per cent., the first named somewhat higher; Wabashaw, 250 per cent.; Carlton and Carver, 125 to 150 per cent.; Mower, Freeborn, and Faribault, 100 per cent.; Dodge, 70 per cent.; Rice and Washington, 50 per cent.; Houston, Winona, Le Sueur, and Scott, 25 to 33 per cent., and several others ranging from 5 to 25 per cent.

An increase of about 75 per cent. in the value of farm lands since the census of 1860 is indicated in Iowa. Dubuque, Story, Calhoun, Marion, Delaware, Sac, Montgomery, Shelby, Chickasaw, Fayette, and Lucas counties from 10 to 25 per cent.; in Clarke, Jackson, Des Moines, Decatur, and Adams, 25 to 33 per cent.; Jefferson, Black Hawk, Muscatine, Cedar, Linn, Clayton, Cherokee, and Wayne, 45 to 50 per cent.; in Louisa and Jasper, 75 per cent.; in Warren, Pottawatomie, Allamakee, Appanoose, Benton, Clinton, Palo Alto, and Marshall, 100 per cent.; in Crawford, Audubon, Jones, Emmett, and Winnebago, 150 per cent.; in Fremont, 250; and Monona as high as 300 per cent. Harrison, Kossuth, Sioux, and other counties report lands "rapidly advancing."

The settled portions of Nebraska show an increase in the value of farm lands

of from 150 to 175 per cent. since 1860. Dodge county an advance of 400 per cent.; Burt and Gage, 200 per cent.; Dixon, Dakota, and Otoe, 100 per cent.; Cass, Richardson, Pawnee, 50 per cent.; Merrick, 33 per cent. In a number of counties the settlements have been made since 1860, when the farms were bought at $1 25 per acre, or entered under the homestead laws. Such is the case with Jefferson, where there are now farms held as high as $15 per acre. In Hall county, in the interior, farms of 160 acres which could be purchased in 1860 for from $300 to $400 now command from $1,500 to $4,000, according to improvements and distance from railroad stations.

The advance in price of farm lands in the settled counties of Kansas may be fairly estimated at not less than 150 per cent., as compared with the census values of 1860, the lowest estimate being 25 per cent. for Nemaha, and the highest 500 per cent for Marshall, Washington, and Saline; Pottawatomie and Butler, 300 per cent. advance; Marion, 200 per cent.; Linn, Johnson, Doniphan, Clay, Chase, Osage, and Woodson, 100 per cent.; Jackson and Franklin, 80 to 85 per cent.; Allen, Miami, Wyandotte, and Leavenworth, 40 to 50 per cent. In Linn county the location of the main trunk-line railroad from the northern lakes to the Gulf of Mexico has advanced the price of lands generally 20 per cent. within a few months. In Marshall, farm lands purchased at government prices in 1860 now sell at from $5 to $20 per acre, according to the quantity under cultivation, and the real estate value of the county is claimed to be at least five times that of 1860, and the same facts are true of Washington and Saline, the Union Pacific railroad (E. D.) running for 30 miles through the county.

A number of the western counties of Missouri, including Holt, Jackson, St. Clair, McDonald, Greene, and Texas, near the southern border, and Howard, Shelby, and Linn, in the northeastern portion of the State, report no material change in the average value of farm lands since 1860, while Montgomery reports an active decline of 20 per cent., Madison 33 per cent., and Stoddard a still higher rate of decrease. Cooper, Ray, Osage, DeKalb, Callaway, Vernon, Audrain, Scotland, Lewis, Buchanan, Lincoln, and Scott, report advances ranging from 4 to 15 per cent.; Gentry, 20 per cent.; Christian, Cedar, Newton, and Dallas, 25 to 30 per cent.; Cass, St. Genevieve, Mercer, 33 to 40 per cent.; Pike, Mississippi, Harrison, Livingston, Iron, Chariton, Boone, Dade, Lawrence, and Nodaway, 40 to 50 per cent.; Cole, 65; Miller and Bates, 80 per cent.; Moniteau, St. Louis, Phelps, Hickory, Johnson, and Henry, 100 to 150 per cent.; and Jefferson reports an advance of 400 per cent. From the several estimates of our reporters there appears to be an average of 30 to 35 per cent. for the farm lands of the whole State since the date named. Our Jefferson reporter accounts for the large increase of price in that county as follows:

Our county is quite broken and hilly, and was considered almost worthless for farming, averaging about $5 per acre, but in 1863-'4 the hills began to attract the attention of fruit growers, since which time prices have been rapidly advancing.

In many counties lands depreciated largely during the war, but have been increasing in value since 1865. From that date they have generally recovered the decline and made the advances noted above the values of 1860. In this regard our Shelby correspondent says:

Farm lands are now about the same as in 1860. They were 25 per cent. lower in 1863-'64 but have advanced at the rate indicated since the latter date. Good farms can be bought here for about $20 per acre.

Another correspondent, in Livingston county, writes as follows:

The price of farm lands in this county has increased about 50 per cent. since 1860. Farms selling in 1860 at from $10 to $40, according to locality, improvement, &c., are now selling at from $15 to $60. For some time during the war real estate diminished in value very much below the prices of 1860, but toward the close of the war it increased rapidly, and has advanced steadily ever since until it has reached the present rates, at which it seems to be on a stand.

The value of California lands has increased materially since 1860. Improved farms will average almost the rate at which they were then held. Amador and Tuolumne counties are alone in reporting a decline, which is attributed in part to a failure of either State or national laws to protect improved lands from miners, who are "ever on the watch to locate claims upon lands improved by the money and toil of the honest settler."

In Oregon the advance in prices varies greatly in different sections of the State. Returns have not been full. Multnomah, in the northern border, claims an increase of 100 per cent. In some counties there has been little improvement, as in Douglas, to which settlers were attracted in 1860 by gold mining, which has since been abandoned. Lane, in the same portion of the State, reports an increase of 10 per cent.

Prices of farm lands in Washington, New Mexico, and other Territories, are exceedingly variable and somewhat fluctuating, as the result of temporary mining operations, though the increase is general and rapid wherever permanent improvements have been made.

VALUE OF UNIMPROVED LANDS.

Unimproved lands in Maine are obtainable at low prices, except in the neighborhood of cities, or in the most highly improved farming sections. Timber cutting has left large bodies of land partially denuded of forests. Such tracts in Cumberland county are purchased at prices varying from $1 to $10 per acre; in Oxford they are valued at $8 for timber-growing. Thinly wooded lots in Somerset and Penobscot are worth $5 per acre, the growth paying for the land. In the Moosehead lake region, in Piscataquis, rocky lands, to some extent cultivable, can be bought for $1 per acre. In Sagadahoc, once a lumbering county, forests are valuable, being worth $5 per acre.

Among the White Mountains are lands difficult of access, in some places heavily timbered, held at merely nominal rates. In the northern part of the State forest lands yet abound, with no active demand, and prices at a low ebb. In accessible locations, in the central and southern parts of the state, wood and timber of all kinds are valuable. In Sullivan the surface is rocky and rough, and the wildest tracts command $5 per acre. Hemlock is abundant, yielding fine returns in bark, for tanning. An average for wild lands in Cheshire is placed at $25 per acre. In Hillsborough, the value depends upon the timber, running into very high figures for the little heavy timber remaining.

In Vermont, unimproved lands are highest in Addison county, a good section of the state, and a county famous for sheep husbandry, in which pasture lands are in demand. The average value of wild lands in this county is placed at $20; $5 in Essex, $6 to $8 in Washington, 8 to $15 in Orange, $10 in Orleans. In some of the counties these lands lie mostly among mountains, with a rough and rocky surface, and are well timbered with hemlock and spruce. The opening of railroad facilities, and the establishing of lumber companies, have doubled the value of timber lands in many places. Spruce, basswood, birch, cherry, white ash, butternut, and other species are used for lumber.

Some unimproved lands in Worcester county, Massachusetts, are reported at the low price of $6 per acre. Wood lands in Barnstable may be found at $5 per acre. In Hampden, rocky and swampy lands, with a sparse growth of wood, are worth $5. In Bristol are swamps which are rising in popular estimation, and are regarded, when reclaimed, as the most valuable grass lands in that region. In Suffolk are salt marshes worth, when ditched and made available for hay, $50 per acre. Swamps in Middlesex, susceptible of drainage, are made to yield large crops of Indian corn, potatoes, oats, or grass. Different classes of unimproved lands are thus estimated: Woodlands, cleared, $16 per acre; swamp lands, capable of drainage, $30; peat meadow, $75. These prices are greater

than those of Barnstable, Bristol, and Hampden, by reason of proximity to Lowell, and a circle of smaller manufacturing towns. In Berkshire, the best prime hemlock and chestnut growth are valued at $250 per acre; lands less densely timbered, at $50 to $75; in less accessible districts, among the mountains, the best wood lands, at $100; an average of $100 per acre for timber lands. When divested of timber, the roughest and most rocky tracts are scarcely worth more than $5 per acre. The planting of the locust is recommended as a profitable disposition of such lands.

There is necessarily but little unimproved land in Rhode Island. In the southern part of the State are swamp or bog lands, that can be obtained at $10 per acre. There are rough lands in Kent of little value but for wood, worth $15 per acre. There is a little rocky or swampy land in Bristol, and some woodland, nearly all of which is pastured. No wild lands are reported in Newport.

A very small extent of swamp or peat land is found in Hartford county, Connecticut. Its value is from $15 to $40 per acre. Small tracts of woodland sell for $25 to $150 per acre. A larger area of uncultivated land is found in Windham county, partly wooded, of some value for pasturage, worth, on an average, $18. In Litchfield are rough pasture lands of low value, and woodland valued at $20 to $50, according to the growth.

An average of $32 per acre is the estimated value of the wild lands of New York. In some cases they are more valuable than cultivated lands; in the mountains of the Adirondack region, and other mountainous localities, tracts are found at low prices. In the more populous sections unimproved lands, with the exception of wood and timber preserves necessary to each farm, are either very hilly or swampy. In the northern part of Oneida the north woods, a wild tract of spruce with a very poor soil, is worth but $5 per acre. In the Catskill mountains, land valued only for bark and timber is held at the same rate. As near New York city as Dutchess county are mountain lands valued at only $10 to $20 per acre. There is a wild tract in Herkimer, containing about 100,000 acres, worth from 50 cents to $5 per acre, very hilly, full of lakes, and wooded with hemlock and spruce—a great resort for hunters and fishermen in the proper seasons. In Suffolk, (on Long Island,) is a large tract which produces quantities of cord-wood, 100,000 cords having been shipped from a single town (Brookhaven) in a single year, estimated at $8 per. acre. In Washington county unimproved lands are valued at $3 per acre. Woodlands, in counties supplied only with wood lots reserved upon farms, are often the most valuable portions of farms, as in Livingston and other counties. In Monroe such lands are worth from $60 to $200 per acre.

The value of wild or unimproved lands of the State of New Jersey varies from $1 to $300, according to location, quality, and resources. In Essex and Hudson counties there are many thousands of acres of salt meadow and swamp lands, which, when reclaimed, must become immensely valuable for gardening purposes, from their proximity to New York and the great depth of rich alluvial matter deposited upon them. A systematic drainage of these flats is now in progress, with prospect of complete success, at an estimated expense of about $10 per acre. In Ocean county the average value is $15 per acre, but poor tracts may be bought at from $1 to $5 per acre; large tracts of swampy or bog lands are adapted to the growth of cranberries, which are extensively cultivated in this county. In Monmouth unimproved lands run from $5 to $300, the latter for very superior timber. Burlington county gives an average of $6 to $10 per acre, pine lands and white cedar swamp, light sand and black peaty soil; the former growing blackberries and strawberries admirably, and the latter, cranberries, which are native to the soil. In Camden and Gloucester, $15 to $20; in Cumberland, Cape May, and Atlantic the price varies from $1 to $10 per acre.

The value of unimproved or wild lands in Pennsylvania is returned at prices ranging from $2 to $45, varying according to location and timber and mineral

resources, averaging from $10 to $12 in the State. In Berks county nearly one-fourth of the surface is hilly and timbered, and is valued at $45 per acre for the timber. York county gives an average of $30; Bradford, Perry, Crawford, Erie, Lawrence, $20; Susquehanna, Wayne, Tioga, Dauphin, Clearfield, Armstrong, Green, Elk, and Warren, $10 to $15; Franklin as low as $2. Much of the wild land is mountainous, and valuable only for the mineral deposits or growing timber, while portions are susceptible of the highest cultivation and improvement, or adapted to grazing and dairy purposes.

In Newcastle county, Delaware, there are little or no wild or unimproved lands. In Kent the average price of such lands is given at $20 per acre, the low swamp lands at $10, while in Sussex the average is placed at $10. A large portion of these lands is capable of high cultivation, and is now being rapidly improved.

The average price of wild or unimproved lands in the several counties of Maryland ranges from $1 to $65 per acre, according to location, resources, &c. In Washington county the waste lands are chiefly in the mountains. In Montgomery the average is from $10 to $20, with little inclination to sell; the lands are principally old fields, grown up in pine and sedge, but with a liberal application of fertilizers and labor are susceptible of high cultivation. Baltimore county contains a large area of unimproved lands, part forest, heavily timbered, part worn out fields, but contiguity to the metropolis of the State is increasing their market value, and they are now selling at an average of $65 per acre. The unimproved land in Harford is chiefly wooded, and the average value is given at $40 per acre. Sedge fields may be purchased at about the same figure. Cecil reports an average of from $10 to $30, and Kent, $10 per acre, most of the latter being low, wet lands, studded in many instances with scrubby timber, but clearing and draining would render most of them valuable. In Queen Anne the average value is from $15 to $30. In Talbot the unimproved land has good red clay subsoil and sandy loam, easily improved, worth now an average of $20 per acre. Anne Arundel reports an average of $35 per acre for such lands, being susceptible of improvement and capable of producing fruits and a good quality of tobacco. In St. Mary's this class of land is chiefly timbered with a light growth of pine, sometimes oak and chestnut, and worth, remote from navigation, $10 per acre, and $20 near the water.

Such has been the waste of war in Virginia that "unimproved" lands have encroached upon cultivated areas until nearly all the State is "wild" land. The tracts in original forest, or thrown out of cultivation and covered with new forest growths, will be included in this branch of the subject. In Patrick and other southwestern counties the price is quoted at $1; in Carroll, 50 cents; in Nelson, 25 cents; in Botetourt, $1 to $3; in Tazewell, $2 50; in Highland, $2 75; in Clarke, $3 to $6; in Washington, $2 to $3; in Buckingham, $2 to $5; in King George, $4 to $10; in Stafford, King William, Norfolk, and Craig, $5; in York and Middlesex, $6; in Lancaster, $5 to $25; in Smyth, $10 to $25. This shows the range of reports. In the tide-water counties prices range from $5 to $15 for wild lands, except on navigable water, where the value depends on the amount of wood and timber, sometimes reaching $50. Good lands at $1 per acre are found in Patrick. Coal lands, four miles from the railroad, in Montgomery, can be bought for $3 to $5 per acre, and for $1 to $2, ten miles from the railroad. In Wythe wild lands are "almost valueless, except in the neighborhood of iron works," one of a class of facts everywhere appearing in Virginia, which illustrate the creation of values in all of a group of products by utilizing one of them. In Tazewell are tracts of thousands of acres, some of them at lower prices than government lands. On these mountain slopes and in valleys the pasturage is unsurpassed in the country, and much of it is excellent land for tobacco, grapes, and fruit. Among the mountains are also rough and rocky areas, of little value except for minerals, in which this county is peculiarly rich. In King William, on the Pamunkey and Mattapony, are rich lands, subject to overflow, obtainable

at $5 per acre. The wild lands of the Blue Ridge are exceedingly desirable for their climate, soil, and location with reference to markets. They can now be obtained for one-fourth to one-half the price of improved farms. The growths are oaks of several varieties, chestnut, hickory, dogwood, poplar, &c.

Three classes of wild lands are found in North Carolina: first, lands exhausted, abandoned, and grown up to bushes; second, virgin uplands, generally well timbered; and third, low or swamp lands, often well timbered. The first, once fertile, can again be restored in time and by good management. The second and third can be had at prices varying from 50 cents to $10 per acre; the first at even lower rates. Pitch and turpentine lands abound in Duplin, Lincoln, Cabarras, Hertford, Sampson, Onslow, and Moore counties, and can be had for from $2 to $5, according to quality and facilities for working and marketing.

In South Carolina very low prices prevail for lands of various character: in Georgetown district, 50 cents to $1 for poor pine lands; in Abbeville, poor ridges and abandoned fields, $2; in Sumpter, sandy with clay subsoil, 50 cents; in Richland, $1 to $5; in Marion, cypress and oak growth, $2; in Barnwell, sometimes yielding 600 bushels sweet potatoes with good tillage, $2. Gold is found on wild land in Spartansburg; lead in the same county; copper and silver in Pickens, very fine ochre in Abbeville, and immense beds of kaolin and superior buhrstone and marl in Barnwell and other districts.

In Georgia the lands classed under the head of wild or unimproved lands embraced about one-fourth the area of the whole State in 1860, the figures at that time being: improved lands in farms, 8,062,758 acres; unimproved, in farms, 18,587,732 acres; wild or waste areas, (including water, &c.,) not in farms, 10,461,510 acres. The proportion of cultivated lands is smaller now than in 1860, and the estimated values given by our correspondents range from 25 cents to $15 per acre, according to location and resources. In Union, Murray, Chattooga, Gordon, Polk, Campbell, Cherokee, Jefferson, Johnson, Greene, Morgan, Carroll, Heard, Taylor, Carlton, Schley, and Church, embracing all the range of temperature and varieties of soil in the State, these wild lands may be purchased at from 25 cents to $1 per acre; while in Floyd, Cobb, Milton, Forsyth, Columbia, Warren, Hancock, Newton, Butler, Houston, Crawford, Stewart, and other counties the average value ranges from $1 75 to $5, generally averaging something over $2. In many sections these lands are mountainous and covered with a heavy growth of timber, and the soil, when cleared and cultivated, capable of yielding good crops of corn, the small grains, potatoes, &c., and are well adapted to fruit-growing; while in others the lands are flat and swampy—of little value but for the timber; but the larger proportion comprise lands susceptible of high cultivation and capable of growing remunerative crops.

There is a large area of wild or unimproved land in Florida, held at figures varying from 10 cents to $8, averaging from $1 to $2 per acre. In Jackson the unimproved lands are claimed to be better than the nominally improved, and may be purchased at from $1 to $2 per acre. In Liberty the average value is given as low as 10 cents—land low, sandy hummock, capable of producing oranges, sugar-cane, corn, potatoes, rice, and long cotton; Leon, $1 50 per acre—quality medium, fair while fresh, easily cleared and cultivated; Baker county, $1 50 per acre—very productive for cotton, sugar-cane, potatoes, vegetables, &c. Duval county, average 50 cents per acre. In Alachua nearly all the wild lands are owned by the State, the general government, or railroad companies. State lands are held at from 50 cents to $8, mostly the former; United States lands are only in the market as homesteads; and railroad lands vary in price from $1 to $2 50. The land is principally "pine barren," considerable heavy pitch-pine interspersed with cypress swamps, and in sections hummock, the latter being very rich. The greater part of the land, however, is valuable only for timber and turpentine. In Levy the land is chiefly timber, and valued according to its location. A portion of this land is comparatively worthless, consisting of sand-hills

and scrub lands covered with brush and filled with a variety of wild animals. There is plenty of government land upon which to settle, some of it the best hummock land, capable of yielding an average crop of 40 bushels of corn; prices from $1 to $5. Manatee county also has considerable hummock lands of first-rate quality, underlaid with marl, worth from $5 to $10 per acre. The timber of the hummock consists of live oak, hickory, red cedar, bog, &c., while the pine is the turpentine or long pine.

The average price of unimproved lands in Alabama may be stated at $1 75, the range being from 12 cents to $5, including a variety in quality and natural capabilities. In Macon, Conecuh, Butler, Chambers, Morgan, Tuscaloosa, and some other counties the general character of such lands is poor—pine forests, with a thin soil, covering large areas. In some sections of the State the uncultivated lands are heavily timbered with pine, oak, hickory, poplar, walnut, mulberry, &c. They are generally attached to plantations, and are used as summer ranges for cattle and hogs. With a proper system of culture and an industrious, energetic population a large proportion of the now unimproved lands will be reclaimed and prove of great value.

Half of the land of Mississippi is not included in farms, and only one-third of the area in farms has ever been at one time under improvement. In the best cotton districts cultivated lands have been comparatively high, but few were ever held at their intrinsic value, on account of the extent of the unoccupied area in the southwest. In the southeastern portion of the State, between the capital, Jackson, and Mobile, in Alabama, the population is sparse; the land mostly unentered; the soil sandy, with a small extent of rich creek bottoms, the price of unimproved tracts varying from 12 cents to $1 per acre. The growth is composed of oaks, hickory, gum, cypress, and long-leafed pine, the latter predominating, of great height and size, of industrial importance in connection with turpentine-making and lumbering. The soil, like other sandy loams, is easily worked, and productive for a few years, becoming exhausted with constant cropping and no fertilizing. A bale of cotton per acre has been obtained upon such soil. Sweet potatoes, in unlimited quantities, are easily produced, and might prove a source of large revenue under the new mode of slicing and drying for distant markets. The castor-oil bean grows finely here, and might be made a source of profit and improvement to the soil. Peaches are a sure and abundant crop, beginning to bear in three years from seed; and wool-growing will prove remunerative and a valuable auxiliary to tillage farming, wild grasses everywhere abounding, succulent and rank in growth by the middle of February. The water is excellent and the climate healthy. All that is needed to start this region upon a career of prosperity is a railroad to the Gulf coast from some point on the Mississippi Central. With such a road, land now a drug at 12½ cents per acre would be greedily taken at $1, and eventually, with improvements, would be cheap at $20. Similar lands, though generally better, on the line of the New Orleans, Jackson and Great Northern road, west of Pearl river, are now obtainable at $5 to $10 or $20 near stations, and are bargains at those prices. In the northern part of the State unimproved tracts average about $1 per acre; in Hinds county, $2 50; in Madison, $2; in Washington, on the river, fine Mississippi bottoms, perhaps unsurpassed in the world, $5 per acre. On the line of the Mobile and Ohio railroad $2 50 is a common price. In De Soto are some 60 sections of "Mississippi bottom" at $4 or less per acre.

Under the heavy depreciation of plantations in Louisiana the market value of wild and unimproved lands must be but nominal, and our correspondents estimate them at from "but little value" to $3 per acre, according to location and resources. These lands are varied in character and quality, from light sandy loam on upland to heavily-timbered bottoms and cypress swamps, the alluvial or red lands being the richest kind when protected from overflow, and the light soil susceptible of thorough cultivation and capable of producing good crops of corn and cotton.

Wild or unimproved lands in Texas range in price from 12½ cents to $10 per acre, and embrace a very large proportion of the total area of the State, less than two per cent. being under cultivation in 1860, the census figures standing: improved lands in farms, 2,650,781 acres; unimproved land in farms, 22,693,247 acres; wild or waste areas, (including water areas, &c.,) 126,541,412 acres. These lands, when owned by the State, may be had for the price of the certificate issued from the land office at Austin. Where lands are held by individuals under Spanish or Mexican grants they may be bought in large tracts as low as 12½ cents per acre, while small tracts held under patents from the State are held at 50 cents to $1 per acre.

Homesteads and other government lands in Arkansas are to be had in nearly all parts of the State—hilly, heavily timbered lands in Montgomery at $1 25; Madison, at $3; Benton, table-lands of Ozark mountains, $3 to $5, suitable for cereals and fruits; Johnson, lands held by speculators at $5 to $8 for river lands, and $3 to $5 for uplands; and State lands at 50 to 75 cents—the same held by speculators at $1 to $3, and, if good farm lands, $3 to $5; Sebastian, river lands $8 to $15 and uplands $2 50 to $5; Union, various soils, at 75 cents; St. Francis, $1 25, capable of producing 400 pounds of cotton, 36 bushels of corn, or 20 bushels of wheat or oats; Mississippi rice lands, annually overflowed and requiring levees, at 50 cents; Monroe, good black loam, at 50 cents to $10; Prairie, hill or upland for 75 cents and bottom lands for $1, yielding 35 bushels corn and 20 bushels wheat. In Drew, farms will produce 200 to 300 pounds ginned cotton, 15 to 25 bushels corn, and 150 to 250 bushels sweet potatoes, without manuring. In Clark, at forced sale, a section (640 acres) sold for $15, and a quarter (160 acres) for $5.

Wild lands in Tennessee are quoted at six cents per acre and upwards, according to location, quality, and capabilities. Much of this land in the eastern counties is hilly or mountainous, furnishing good summer pasturage, with abundant and valuable timber, and capable of producing good crops of corn and other products. Tracts can be procured at $1 or less in Greene, Sevier, Monroe, Polk, Rhea, Bledsoe, Marion, Coffee, Lincoln, Giles, Montgomery, Stewart, Dickson, Hickman, Perry, and all mountainous counties. The highest price reported for wild lands is $15 per acre in a portion of Weakley county. Among these low-priced lands are those with a "red sandy loam, rich and strong," tracts of "second bottom, upland, ridge, and mountain land well timbered, with good water, healthy, producing corn and wheat, and excellent for fruits and tobacco;" soils where "fruits, especially peaches, grow to perfection," and localities with "bottoms level and exceedingly fertile, upland, rolling, and tolerably productive." There are higher-priced lands of great fertility, as in Haywood, at $3 to $8; "the greater portion in the Hatchie and Forked Deer river bottoms subject to overflow, and thus unfit for farming purposes, yet abounding in the finest oak and cypress timber, and, with levees, capable of becoming the finest farm lands."

The estimated value of unimproved lands in Kentucky varies from $1 per acre up to the price of improved lands in the several counties; Rockcastle and Pulaski are the only counties reporting as low as $1 per acre, the land in the former being "poor, hilly, and heavy," and in the latter "varying from poor freestone plateaus to rich, north slopes and hollows in limestone, suited to fruit culture." Lewis, Lincoln, Butler, Christian, and Graves, report from $2 per acre upwards; most of those at $2 being mountainous and poor, though some are covered with heavy forests and are susceptible of improvement and will produce good crops. Russell, Edmonson, Webster, Livingston, Ohio, Hardin, Laurel, Greenup, and others, vary from $2 50 to $5 per acre; Anderson, Owen, Franklin, Trimble, and Metcalfe, $5 to $10 per acre; while Todd and Pendleton estimate at $20; Kenton, $25; Oldham, $30; and Bourbon as high as $75 to $80 per acre; the higher figures representing lands in close proximity to cities, upon lines of railroad, or with valuable timber accessible to market. In Bourbon county the

lands in grass, without building improvements, are valued at $75 per acre. Along the Kentucky river these unimproved lands are generally rocky and hilly, and in timber, suited to grass and fruits.

In the Panhandle counties of West Virginia wild land is unknown. All is included in farms, and timber reservations are generally occupied as sheep pastures, the underbrush being kept clear. These "wood pastures" are often quite valuable adjuncts to the arable portion of the farms. The unimproved land or woodland of Harrison is held at $20 per acre. Unimproved tracts in Wood county are placed at $6 per acre. In Marshall, on the Ohio, below Wheeling, unimproved lands are worth from $6 to $25 per acre. The average price of unimproved lands in Kanawha is $5 per acre. Unimproved lands in Tyler are valued at $6 per acre; in Barbour, $2 to $5; in Randolph, $3, adapted to grass and grain; in Nicholas, $2; in Cabell, $2, suitable for grazing and fruit growing; in Grant, $1, good for sheep pasture and timber; in Webster, 75 cents, valuable for grape culture and wool-growing.

About one-third of the counties of Ohio report no lands under the head of "wild or unimproved;" others have but little of that class, while the values of those reported average from $15 to $20 per acre, the lowest average for any county returned being $6 per acre. In the western and northwestern part of the State is a large area of almost unbroken forest, nearly level, with soil of good capacity, in many cases held at only $5 to $10 per acre. This section is heavily timbered with oaks, poplar, walnut, and other valuable kinds of timber. A large portion of Henry county is included in the famous "Black swamp," reaching over an extent of 120 by 40 miles, said to be unsurpassed in the State for fertility of soil; surface high and level, with dense growth of forest trees; soil from three to twelve inches deep, composed of decayed leaves and vegetable matters; subsoil a yellow clay loam, rich in lime, potash, and silex. In Ottawa, on Lake Erie, the wild are chiefly marsh and timber, there being no less than 20,000 acres of marsh in this county, valued at $1 to $5; the timber averages $20 per acre; soil excellent. The southeastern counties, bordering on the Ohio river, contain much unimproved lands, containing iron and coal, and very suitable for sheep husbandry.

Unimproved lands in Michigan are reported at various figures, from the government minimum prices up to $50 per acre, according to location and condition. In Ontonagon, in the northwest, on Lake Superior, the average value is $6 per acre. Delta county, $1 25 to $2 50; Leelenaw government lands, $1 25; held by individuals, $5 per acre; Mason government lands, $1 25 to $2 50; State swamp, $1 25; railroad, about $2 50; the swamp is in cedar, ash, and hemlock timber; when cleared makes good grass land; Muskegon, $8 per acre; soil partly clay loam, remainder sandy; Ottawa, $8 50 on an average, though some fruit lands are selling as high as $50 to $75 per acre; Kent, average value $15; Van Buren, $16 per acre; Cass, $25, if dry enough for cultivation without draining; Branch, $10 to $40 per acre, mostly timber; Hillsdale, $10 per acre, generally broken by hills and swamps; Jackson, worth $25 to $30 per acre; Calhoun, $15 per acre; Barry, $10 per acre; Clinton, unimproved farming lands are worth $9 per acre; Gratiot, $6 per acre, chiefly farm land, very fertile, producing large crops of grain and grass; Macomb, $25 per acre; Lapeer, $5 to $20; Mackinaw, $1 25 per acre; Bay, $7 per acre, well timbered; Iosco, $4 to $15 per acre; Alcona, $1 25 per acre, though holders of pine land reserve it at that price; Alpena, a large portion of the farming lands belong to the government, and can be purchased at $1 25 per acre, while land in second hands commands from $3 to $20, according to quality and location. In several counties all the unimproved and timber lands belong to farms, and are not in the market separately.

Unimproved lands in Indiana vary greatly in price, according to location and resources. If located near railroads, and especially if timbered heavily, they

are often worth more than improved lands. Some of the finest black walnut in use by cabinet-makers is obtained from this State. Peat lands are attracting considerable attention in St. Joseph. In many counties are found coal, building stone, and iron ore, which enhances the value of the lands.

There is much Illinois land not yet brought into cultivation, but a very large proportion is included in farms, some of them still owned by non-residents awaiting the improvements of neighbors to become valuable without expense to the proprietors. In 1860 the improved land was returned at 13,096,374 acres; unimproved upwards of 22,000,000 acres, since which date these proportions have greatly changed. Prices of course have a wide range—from $2 to $200 per acre. As specimens of returns in a few localities in different parts of the State, the following counties and prices are named: Stephenson, $10 to $15 per acre; Winnebago, $30 per acre; unimproved timber land with timber cut off, $6 to $15; Kane, swamps owned by the county, $4 to $10; Cook, $35, mostly low bottom land too wet for cultivation, yet capable of producing good pasturage and meadow; Will county, $20; Grundy, $16; Lee, $4 to $12; Bureau, average $15.

The value of the wild or unimproved land in Wisconsin runs from 75 cents up to $50 per acre. In Sauk county the average is fixed at $4 50 per acre; Columbia, $8; Marquette, $2 50, chiefly good for pasture; Green Lake, $10, mostly timber land and marsh; Portage, $2 to $10, embracing all grades, from rich alluvial bottom to high mountain range; Outagamie, $15, soil mostly black loam; Calumet, $20 to $25, forest, hilly, very fertile; Door, $3; Brown, $1 25 to $50, red clay and black muck; Fond du Lac, $10 to $50, according to capacity for natural hay or burden of timber; Washington, $30, timber, good soil; Ozaukee, $50, timber; Racine, $16, about 30 per cent. timber, 10 per cent. prairie, and 60 per cent marsh; Green, $15; La Fayette, $10 to $20, the former for barrens, oak openings or brush lands; Crawford, $5; Richland, $3 50, rich, black muck; Vernon, $3, very rich; Monroe, $3, good soil, well timbered; Jackson, $2 to $10, on the east side of Black river the soil is sand loam and extensive pine, tamarac, and cranberry swamps, on the west side mostly oak land and openings, and small prairies and valleys.

In Minnesota, vast quantities of government lands are yet unsold, and may be purchased at the minimum price of $1 25 per acre, or entered as homesteads. In the counties which have been taken up, unimproved lands are held at higher figures, from $2 per acre upwards. In Carlton, such lands command $3 per acre, loamy, but in small tracts light and sandy; in Crow Wing, $2 50 per acre; Morrison, containing public lands, $1 25, presenting rare advantages for settlement under the homestead laws; Monongalia and Wright, $5; Washington, $8, the southern half of the county mostly prairie of the best quality; Carver, $8; Scott, woodlands, $15; Rice, $7; La Sueur, $6 to $10, capable of producing large crops for a long series of years without manure; Nicollett, $2 50 to $10; Brown county, a portion of the "Sioux reserve," is in the market, at $1 25 per acre; Watonwan, $7 50; Faribault, $3 to $6; Mower, $6; Freeborn, $3 50, suitable for farming or grazing; Dodge, $12 for tillable prairie, timber $20; Wabashaw, $12 50, rich prairie; Winona, $5; Houston, $7, soil fertile and productive, especially for wheat. There is a vast area or territory yet unsurveyed within the limits of this State, perhaps one half of the whole State, embracing a variety of soil, which will be open to settlers as soon as the demand shall require the government survey.

Unimproved lands in Iowa range in price from $1 25 to $25 per acre, the former being the minimum price for public lands remaining unsold. The average value of these lands now in private hands, or the property of speculators, is probably $6 to $8; the range of prices is very extensive. In Muscatine there are unimproved lands contiguous to the county seat held at $150 to $200, while in the valley of Cedar river lands can be bought at prime cost, $1 25. Calhoun county contains 300,000 acres of excellent lands that are unoccupied,

worth $3 per acre. Prices rapidly advance with accession of population and commencement of improvement, and railroads enhance real estate estimates with wonderful rapidity; so that high prices do not so much represent superior quality of soil as peculiar advantages of position, and the accident of improvement.

The wild and unimproved lands of Missouri range in price from $1 to $70 per acre, embracing in character and soil as great a variety as in price. In Carter county this description of land is assessed at $1 30 per acre. Excellent land for cereals, the vine, and other fruits, and for stock-growing, may yet be had in nearly all portions of the State at comparatively low rates. An account of the agricultural and mineral resources of the uncultivated lands of Missouri would fill a volume. The northern counties present superior inducements for wheat growing; the northeastern and Missouri river region for fruits; and the southwestern section for dairying, wool-growing, and beef production.

There is still a great deal of government land subject to entry under the homestead laws, or purchasable at the established prices for public lands. In 1860 the total area not included in farms exceeded 21,000,000 of acres, against about 20,000,000 taken up in farms, only about 6,000,000 of which was actually under cultivation.

Unimproved lands in Kansas are held at figures ranging from the government price for public lands up to $10 per acre. In the vicinity of Leavenworth rolling prairies, belted at regular intervals of one to one and a half miles with oak, walnut, hickory, elm, cottonwood, and pine timbers, with soil a deep, rich, sandy, vegetable mould, capable of yielding enormous crops, are worth $6 per acre. The Osage lands are held at from $1 up to $20, average $3 50, consisting of timber lands, with running water; second bottom or middle lands; prairie, with running or standing water; upland prairie, with ravines and buffalo wallow or thin clay lands. In Woodson, at $2 to $6, there is rich, sandy, rolling prairie, capable of producing 2 tons of wild grass to the acre, 37½ bushels of oats, and 22 bushels of wheat. There is still a vast area of public lands in Kansas held at government prices, the amount in 1860 reaching 50,265,130 acres, against less than 2,000,000 acres taken up in farms.

The value of wild or unimproved lands in Nebraska ranges from the government minimum price of $1 25 up to $10 per acre. There are millions of the best prairie lands in the State to be purchased at government prices, or subject to entry under the provisions of the homestead acts, but a small proportion of the State having been taken up by settlers or speculators. In 1860 there were over 48,000,000 acres of wild or waste areas in Nebraska, against less than 700,000 acres included in farms.

The average value of wild or unimproved land in Yuba county, California, is $4 per acre, capable of producing immense crops of wheat and other cereals; in Monterey the price ranges from 50 cents to $2 50 per acre; Del Norte, $1 25, chiefly mountainous, and all heavily timbered, mostly with red wood. In Amador our reporter says the wild lands are worthless. In Tuolumne these lands belong to the United States, and may be taken up by settlers. The valleys have a rich alluvial soil, capable of raising almost any crop with irrigation. The hills are volcanic, calcareous, granitic, and slaty, and furnish the best of sites for vineyards, and yield good crops of grain if sown early in the season. Our San Francisco correspondent, speaking for the State, says:

We have so sparse a population, however, that there are vast quantities of good arable land which can be purchased of government at from $1 25 to $2 50 per acre, while some of the large grant owners are willing to sell good lands, but not very eligibly situated for market, at the same prices. The Central and Western Pacific railroad companies also sell land within a few miles of the lines of their roads from $2 50 to $10 per acre. Almost all of the valley lands of the State may be termed wheat lands, the great majority, with proper ploughing, producing from 15 to 40 bushels per acre. Almost any product of the north temperate zone can be raised on the ordinary lands in California. Beside the parties named the State has large quantities of swamp or overflowed lands, (which can be reclaimed at moderate expense,) and school-lands in different sections, which can be purchased at from $1 to $2 50 per acre.

Probably two-thirds of the lands of Oregon are for sale at government prices; settlements now being principally confined to a strip bordering upon the Pacific, and embracing about one-third of the area of the State. There is much declivitous and barren mountain land, and many fertile valleys capable of supporting a large population.

The settled land of Washington Territory is chiefly valley, heavy, rich, alluvial soil, suited to the cereals and vegetables. In some localities the land is prairie, good for wheat and fine for grazing. There is a vast quantity of government land remaining for sale, or subject to entry under the homestead laws, or soldiers' warrants, in this Territory.

The wild lands in New Mexico are of little value. Lands held by private parties fluctuate in accordance with the necessities of the holder or the wants of the purchaser. There are large tracts of land, however, subject to entry under the homestead laws, or purchase at government prices. They are at some distance from settlements, and are visited by hostile Indians. The country is very mountainous, but has rich valleys in which almost anything will grow to advantage when water can be procured for irrigation.

RECAPITULATION.

The following is a statement showing the increase or decrease of nominal values of farm lands in the several States since 1860.

States.	Increase, per cent.	Decrease, per cent.	States.	Increase, per cent.	Decrease, per cent.
Maine	19	....	Mississippi	....	65
New Hampshire	17	....	Louisiana	....	70
Vermont	17	....	Texas	....	28
Massachusetts	17	....	Arkansas	....	55
Rhode Island	18	....	Tennessee	....	18
Connecticut	20	....	West Virginia	32	....
New York	28	....	Kentucky	10	....
New Jersey	30	....	Missouri	32	....
Pennsylvania	25	....	Illinois	42	....
Delaware	66	....	Indiana	27	....
Maryland	20	....	Ohio	32	....
Virginia	....	27	Michigan	70	....
North Carolina	....	50	Wisconsin	50	....
South Carolina	....	60	Minnesota	100	....
Georgia	....	55	Iowa	75	....
Florida	....	55	Kansas	150	....
Alabama	....	60	Nebraska	175	....

WOOL AND WOOLLENS.

The supply of wool for the fiscal year ending June 30, 1867, was from the home product, (1866,) 115,000,000 pounds; the imports of 1866, 67,917,031 pounds, besides the accumulation from previous importation, and a considerable introduction of shoddy. This produced a glut in the market from which wool-growers suffered severely, while the manufacturers endured a pressure of equal severity from over-importations of woollens and from immense stocks of army goods. Other countries were in the same condition of over-production, and our wool-producers have only been saved from utter prostration by the timely enactment of the tariff law.

Although the tariff did not go into effect at the commencement of the fiscal year, leaving 10,000,000 pounds to come in within the month of July, the imports for the year were reduced to 36,318,299 pounds.

The following will show the falling off, in quantity and value, in the fiscal year 1866, ending June 30, 1867:

	Dutiable.	Free.	Total.
	Pounds.	*Pounds.*	*Pounds.*
1865	40, 372, 075	3, 486, 079	44, 858, 154
1866	67, 917, 031	1, 206, 234	69, 123, 265
1867	36, 318, 299	....	36, 318, 299

The following is an estimate of the wool on hand in the several States at the close of the last winter:

States.	Pounds.	States.	Pounds.
Maine	263, 389	Louisiana	11, 778
New Hampshire	278, 176	Texas	310, 262
Vermont	1, 406, 785	Arkansas	23, 437
Massachusetts	210, 176	Tennessee	46, 205
Rhode Island	51, 220	West Virginia	236, 250
Connecticut	194, 895	Kentucky	313, 551
New York	3, 997, 512	Missouri	330, 609
New Jersey	38, 788	Illinois	957, 750
Pennsylvania	1, 796, 550	Indiana	504, 378
Delaware	8, 193	Ohio	1, 615, 108
Maryland	66, 129	Michigan	1, 480, 571
Virginia	131, 725	Wisconsin	620, 649
North Carolina	71, 650	Minnesota	58, 053
South Carolina	28, 778	Iowa	932, 895
Georgia	75, 570	Kansas	27, 483
Alabama	46, 286		
Mississippi	77, 184	Total	16, 211, 985

The increase of wool-growing west of the Mississippi is very marked. This is shown by the movement of railroad freights and the course of trade. The shipments of wool from Chicago have regularly increased since 1860, when they were only 839,269 pounds. The rapidity of the increase for five years is thus shown:

	Pounds.
Year ending March 31, 1864	3, 435, 967
Year ending March 31, 1865	7, 554, 379
Year ending March 31, 1866	9, 923, 069
Year ending March 31, 1867	12, 391, 933
Year ending March 31, 1868	11, 293, 717

Chicago prices have been as follows since 1862, at which date the currency had not depreciated, and wool commanded a price in the early part of the season, little above the average value of wool for a previous period of five years or more:

	1867.	1866.	1865.	1864.	1863.	1862.
June	24 to 47	30 to 35	45 to 52	64 to 86	50 to 55	25 to 50
July	20 to 50	45 to 50	45 to 56	75 to 95	55 to 60	25 to 50
August	17 to 48	44 to 48	55 to 56	82 to 105	55 to 62	45 to 50

Imports of wool during the fiscal year ending July, 1 1867, as reported by the Treasury Department.

Countries.	Wool on the skin or wool skins.	Under act March 3, 1865.		Under act July 28, 1866.		Class No. 1.—Clothing wools.		Class No. 2.—Combing wools.			
		Wool: value 12 cents per pound or less.		Wool: value 12 cents per pound or less; cost increased by additional charges to over 12 cts. per pound.		Value 32 cents or less per pound.		Value 32 cents or less per pound.		Value over 32 cents per pound.	
	20 per cent.	3 cents per pound.		4 cents per pound.		10 cents per pound and 11 per cent.		10 cents per pound and 11 per cent.		12 cents per pound and 10 per cent.	
		Lbs.		*Lbs.*		*Lbs.*		*Lbs.*		*Lbs.*	
Russia on the Baltic and White seas											
Russia on the Black sea		267,248	$26,997								
Prussia											
Sweden and Norway											
Denmark											
Hamburg	$461	29,175	3,385								
Bremen											
Holland											
Dutch West Indies		7,196	618								
Dutch Guiana											
Dutch East Indies											
Belgium											
England	7,947	1,658,010	163,672	48,293	$5,860						
Scotland											
Ireland											
Canada	18,778	7,869	721					147,690	$45,592	25,734	$9,047
Other Br. Am. Provinces on the Atlantic	22,829	11,100	1,174					3,662	375		
British Am. Provinces on the Pacific		2,095	252								
British West Indies	632	2,466	238								
British Guiana	353										
British Possessions in Africa	112,338	5,664	628					226,513	36,490		
British East Indies	2,755	56,608	4,803					7,113	311		
Australia	35							467,025	401,872		
France on the Atlantic	810	243,299	28,599								
France on the Mediterranean		768,378	87,540								
French North American Possessions											
French West Indies											
French Guiana											
French Possessions in Africa											
Spain on the Atlantic											
Spain on the Mediterranean											

Imports of wool during the fiscal year ending July 1, 1867—Continued.

Countries.	Wool on the skin or wool skins.	Under act March 3, 1865.		Under act July 28, 1866.		Class No. 1.—Clothing wools.		Class No. 2.—Combing wools.			
		Wool: value 12 cents per pound or less.		Wool: value 12 cents per pound or less; cost increased by additional charges to over 12 cts. per pound.		Value 32 cents or less per pound.		Value 32 cents or less per pound.		Value over 32 cents per pound.	
	20 per cent.	3 cents per pound.		4 cents per pound.		10 cents per pound and 11 per cent.		10 cents per pound and 11 per cent.		12 cents per pound and 10 per cent.	
		Lbs.		*Lbs.*		*Lbs.*		*Lbs.*		*Lbs.*	
Cape de Verde Islands		140	$11								
Turkey in Europe		17, 076	1, 920								
Turkey in Asia		1, 349, 149	157, 355	29, 899	$4, 171						
Liberia											
Other ports in Africa		3, 199	406								
Hayti											
Mexico	$25	6, 300	352								
Nicaragua											
United States of Colombia		2, 212	279								
Brazil	510	578, 969	62, 036								
Uruguay	955	212, 194	25, 339			280, 599	$52, 409	137, 402	$23, 681		
Buenos Ayres, or Argentine Republic	164, 818	1, 534, 795	158, 639			2, 082, 032	314, 700	2, 765, 930	426, 285		
Chili		3, 570, 816	352, 175								
Hawaiian Islands						2, 122	284				
Total	333, 246	10, 333, 938	1, 077, 139	78, 192	10, 031	2, 364, 753	367, 393	3, 755, 335	634, 606	25, 734	$9, 047

Imports of wool during the fiscal year ending July 1, 1867—Continued.

Countries.	Sheep-skins raw or unmanufactured, with the wool on, washed or unwashed.	Wool: value over 12 and not over 24 cents per pound.		Wool: value over 24 and not over 32 cents per pound.		Wool: value over 32 cents per pound.		Woollen rags, waste, shoddy, mungo, and flocks.		Woollen flocks, waste, or shoddy.	
	3 per cent.	6 cents per pound.		10 cents per pound and 10 per cent.		12 cents per pound and 10 per cent.		12 cents per pound.		3 cents per pound.	
		Lbs.		*Lbs.*		*Lbs.*		*Lbs.*		*Lbs.*	
Russia on the Baltic and White seas										33, 937	$3, 510
Russia on the Black sea		1, 253, 501	$272, 741								
Prussia											
Sweden and Norway											
Denmark											
Danish West Indies		5, 606	720	33, 320	$8, 327	5, 685	$2, 140				
Hamburg								174, 026	$16, 832	749, 321	78, 536
Bremen	$371							92, 901	10, 699	82, 528	8, 546
Holland											
Dutch West Indies		296	38								
Dutch Guiana											
Dutch East Indies											
Belgium		66, 765	10, 558					85, 403	7, 773	278, 816	27, 890
England		4, 752, 427	1, 029, 024	107, 138	35, 288	164, 441	65, 741	575, 591	44, 910	3, 036, 022	290, 477
Scotland		28, 511	6, 109								
Ireland											
Canada	2, 952	19, 948	4, 681	49, 487	15, 035	323, 474	123, 704			4, 689	389
Other British American provinces on the Atlantic.		2, 759	500	16	4						
British American provinces on the Pacific										172	20
British West Indies	19	40	6								
British Guiana	72										
British possessions in Africa	1, 056	1, 800, 863	302, 348								
British East Indies		91, 042	13, 774			17, 162	5, 690				
Australia											
France on the Atlantic		71, 429	17, 262					12, 852	3, 115	*74, 978	25, 381
France on the Mediterranean		154, 274	31, 419								
Cuba								1, 825	21		
Porto Rico											
Italy								5, 058	140	8, 764	183
Turkey in Asia		90, 091	16, 475								

* Probably includes fur waste.

Imports of wool and manufactures of wool during the fiscal year ending July 1, 1867—Continued.

Countries.	Sheep-skins raw or unmanufactured, with the wool on, washed or unwashed.	Wool: value over 12 and not over 24 cents per pound.		Wool: value over 24 and not over 32 cents per pound.		Wool: value over 32 cents per pound.		Woollen rags, waste, shoddy, mungo, and flocks.		Woollen flocks, waste, or shoddy.	
	3 per cent.	6 cents per pound.		10 cents per pound and 10 per cent.		12 cents per pound and 10 per cent.		12 cents per pound.		3 cents per pound.	
		Lbs.		*Lbs.*		*Lbs.*		*Lbs.*		*Lbs.*	
Liberia											
Other ports in Africa		2,173,608	$409,836								
Mexico								3,246	$52	167	$5
Nicaragua		27,334	3,469								
Brazil	$216	1,301,835	239,393								
Uruguay		894,399	135,348								
Buenos Ayres, or Argentine Republic	3,078	5,712,556	953,013	570,961	$96,470						
Chili		39,381	5,417								
Hawaiian Islands		13,583	2,364	223	37						
Total	7,764	18,410,248	3,454,495	761,145	155,161	510,762	$197,275	950,902	83,542	4,269,394	434,937

Summary.

	Pounds.	
Wool at 12 cents per pound, or less, (act March, 1865)	10,412,130	$1,087,170
Wool, value 12 cents per pound, or less, cost increased by additional charges to over 12 cents per pound, (act July 28, 1866)	78,192	10,031
Clothing wools, class No. 1, 32 cents or less	2,364,753	367,393
Combing wools, class No. 2, 32 cents or less	3,755,335	634,606
Combing wools, class No. 2, 32 cents or more	25,734	9,047
Wool at 12 to 24 cents per pound	18,410,248	3,454,495
Wool at 24 to 32 cents per pound	761,145	155,161
Wool at 32 cents or more per pound	510,762	197,275
Total	36,318,299	5,915,178
Shoddy, &c., at 12 cents per pound duty	950,902	$83,542
Shoddy, &c., at 3 cents per pound duty	4,269,394	434,937
Total	5,220,296	518,479

Imports of manufactures of wool during the fiscal year ending July 1, 1867.

	Duty.	Quantity.	Value.
Woollen cloths, at $2 or less per square yard	24 cts. per lb. and 40 per ct	7,081,279	$9,462,367
Woollen cloths, at over $2 per square yard	24 cts. per lb. and 45 per ct	81,696	159,915
Shawls at less than $2 per square yard	24 cts. per lb. and 40 per ct	12,840	20,953
Shawls at $2 and over per square yard	24 cts. per lb. and 45 per ct	61	179
Blankets not over 28 cents per pound	12 cts. per lb. and 20 per ct	610,438	127,843
Blankets over 28 and not over 40 cents per pound	24 cts. per lb. and 25 per ct	55,944	19,562
Blankets over 40 cents per pound	24 cts. per lb. and 30 per ct	134,146	75,589
All other manufactures of wool not specified, value less than $2 per square yard.	24 cts. per lb. and 40 per ct	567,460	414,420
All other manufactures of wool not specified, value over $2 per square yard.	24 cts. per lb. and 45 per ct	23	73
Flannels, not colored, at 30 cents or less per square yard.	24 cts. per lb. and 30 per ct	6,213	8,773
Flannels, colored and white, at over 30 cents per square yard.	24 cts. per lb. and 35 per ct	95,215	119,406
Flannels composed in part of silk	50 per cent	133	269
Carpets—Wilton, Saxony, Aubusson, velvet, and all Jacquard woven, at $1 25 or less per square yard.	70 cents per square yard	64,786	71,820
Carpets, over $1 25 per square yard	80 cents per square yard	378,527	557,070
Carpets, Brussels or tapestry, printed on the warp.	50 cents per square yard	1,450,667	1,475,632
Carpets, treble ingrain, 3 ply, and worsted chain Venetian.	40 cents per square yard	52,618	40,046
Carpets, two ply, ingrain, and yarn Venetian	35 cents per square yard	168,169	126,083
Carpets, druggets, bockings, and felt	25 cents per square yard	247,980	117,333
Carpets, of wool, flax, or whatever material not otherwise provided for.	40 per cent	138,991	332,666
Yarns of wool and worsted, at less than 50 cents per pound.	16 cts. per lb. and 25 per ct	476	199
Yarns of wool, over 50 cents, not above $1 per pound.	20 cts. per lb. and 25 per ct	46,230	40,288
Yarns, value over $1 per pound	24 cts. per lb. and 30 per ct	308,577	394,563
Balmorals, and all skirting of wool, worsted, or other material.	24 cts. per lb. and 35 per ct	278,179	256,543
Dress goods of wool or worsted, wholly or in part, gray or uncolored, at not over 30 cents per square yard.	4 cts. per square yard and 25 per cent.	396,455	86,218
Dress goods of wool or worsted, wholly or in part, gray or uncolored, at over 30 cents per square yard.	6 cts. per square yard and 30 per cent.	182,201	61,420
Printed or colored, at not over 30 cents per square yard.	4 cts. per square yard and 30 per ct.	36,826,901	8,707,175
Printed or colored, at over 30 cents per square yard.	6 cts. per square yard and 35 per cent.	15,771,611	7,104,722
Hosiery, shirts, and other knit goods of wool or mixed.	20 cts. per lb. and 30 per ct	368,234	853,160
Bunting, and other manufactures of worsted, mohair, alpaca, or goat's hair, &c., not otherwise provided for.	50 per cent		6,468,332
Felting and endless belts for paper or printing machines.	20 cts. per lb. and 35 per ct	147,943	149,629
Hats of wool	24 cts. per lb. and 25 per ct	626	2,493

Imports of manufactures of wool, &c—Continued.

	Duty.	Quantity.	$Value.
Mats, screens, rugs, covers, &c., as carpets of like material, all other mats of wool and other material.	45 per cent		$133, 955
Ready-made clothing, wholly or in part of wool.	24 cts. per lb. and 40 per ct.	79, 888	181, 619
Cloths	50 cts. per lb. and 35 per ct.	1, 723, 522	2, 624, 141
Shawls	50 cts. per lb. and 35 per ct.	75, 422	264, 006
All manufactures wholly or in part of wool not otherwise provided for.	50 cts. per lb. and 35 per ct.	12, 714	14, 467
Flannels		4, 174	6, 328
Blankets		101. 840	72, 038
Hats of wool		153 216	121, 166
Knit goods, hosiery		36, 762	90, 844
Shirts, drawers, and other knit goods		4, 969	7, 039
Balmorals		4, 117	4, 995
Woollen and worsted yarns		122, 478	155, 496
All manufactures of every description, composed wholly or in part of worsted.		65, 269	74, 690
Women and children's dress goods, and real or imitation Italian cloths, wholly or in part wool or worsted.		11, 616, 335	3, 437, 717
Clothing, ready-made, and wearing apparel of every description, composed wholly or in part of wool or worsted.			
Ready made	50 cts. per lb. and 40 per ct.	22, 739	47, 092
Articles of wear	50 cts. per lb. and 40 per ct.	116	308
Webbings, beltings, bindings, braids, galloons, &c., of wool, worsted, or mohair, or in part of either, unmixed with silk.	50 cts. per lb. and 50 per ct.	101, 984	186, 434
Bunting	20 cts. per square yard and 35 per cent,	14, 706	5, 662
Carpets, Aubusson and Axminster, and carpets woven whole.	50 per cent		6, 372
Carpets, Saxony, Wilton, and Tournay velvet, wrought by the Jacquard machine.	70 cts. per square yard and 35 per cent.	17, 566	41, 365
Carpets, Brussels, wrought by the Jacquard machine.	44 cts. per square yard and 35 per cent.	187, 896	281, 369
Carpets, patent velvet and tapestry velvet	40 cts. per square yard and 35 per cent.	59, 135	104, 647
Carpets, tapestry Brussels	28 cts. per square yard and 35 per cent.	681, 918	647, 958
Carpets, treble ingrain, 3-ply, and worsted chain Venetian carpet.	17 cts. per square yard and 35 per cent.	18, 870	18, 241
Carpet, yarn, Venetian, and 2-ply ingrain	12 cts. per square yard and 35 per cent.	28, 666	21, 013
Carpets, druggets and bockings, printed, colored, or otherwise.	25 cts. per square yard and 35 per cent.	15, 574	8, 903
Carpets of wool, not otherwise specified	40 per cent.		8
Total			45, 813, 919

It will be seen that four-fifths of the imports of wool have come in either at three or six cents duty; that the average original cost of the entire importation but slightly exceeds 16 cents per pound; that the average duty on all low-priced wool does not reach five cents, and on total imports scarcely six cents per pound. Buenos Ayres has furnished 22 per cent. of foreign wools, England 19, Chili 10, and Brazil 5 per cent. The increase of duty from three to six per cent. appears to have excluded practically the Chili wool. Under the six cents duty the importations from England and Russia, on the Black Sea, have each averaged 21 cents, while those from Buenos Ayres and the Cape of Good Hope have averaged about 16 cents.; the total imports under the three cents duty (value 12 cents or less) average 10 cents, and those of the six cents duty (value 12 to 24 cents) average nearly 19 cents.

AGRICULTURAL EXPORTS.

Statement of the exports of the growth and agricultural products of the United States, with their immediate manufactures, for the year ending June 30, 1867.

Products and manufactures.	Quantity.	Value.
Animals, living—hogs ....number..	3,557	$40,092
Horned cattle ....do....	10,221	268,236
Horses ....do....	905	140,549
Mules ....do....	1,606	213,599
Sheep ....do....	7,882	69,842
All other and fowls ....do....	....	45,370
Poultry	....	776
Animal matter—guts, skins, bladders, &c	....	19,018
Pork ....pounds..	27,374,877	3,597,690
Hams and bacon ....do....	25,648,226	3,291,176
Lard ....do....	45,608,031	6,634,556
Lard oil ....gallons..	144,158	176,363
Neat's-foot and other animal oils ....do....	13,968	15,189
Beef ....pounds..	14,182,562	1,727,350
Preserved meats	....	146,992
Tallow ....pounds..	23,296,931	2,747,618
Hair, unmanufactured	....	67,055
Hair, manufactured	....	17,420
Butter ....pounds..	4,912,355	1,184,367
Cheese ....do....	52,352,127	7,893,535
Candles, tallow, &c ....do....	3,298,038	566,492
Soap, perfumed ....do....	....	50,467
Soap, other ....do....	5,493,954	559,565
Glue ....do....	9,760	2,502
Stearine ....do....	29,906	3,786
Wax ....do....	253,065	96,282
Leather ....do....	462,946	160,080
Leather, morocco and other fine ....do....	....	13,181
Leathern boots and shoes ....pairs..	313,290	681,706
Leathern saddlery and harness	....	97,352
Leathern manufactures not specified	....	97,288
Wool ....pounds..	307,418	130,857
Manufactures of wool not specified	....	94,698
Furs and skins	....	1,664,066
Apples, green or ripe ....bushels..	81,337	142,023
Fruit, green, ripe, or dried	....	158,993
Potatoes ....bushels..	512,380	505,875
Onions ....do....	115,466	108,714
Pickles and sauces	....	18,797
Breadstuffs—Indian corn ....bushels..	14,889,823	14,871,092
Indian meal ....barrels..	284,281	1,555,585
Wheat ....bushels..	6,146,411	7,882,555
Wheat flour ....barrels..	1,300,106	12,803,775
Rye ....bushels..	147,353	133,514
Rye flour ....barrels..	14,603	112,414
Other small grain and pulse	....	2,897,834
Rice ....pounds..	1,391,007	100,338
Bread and biscuit ....do....	7,610,400	626,061
Cotton, sea-island ....do....	6,742,314	4,354,841
Cotton, other kinds ....do....	654,731,274	197,115,582
Cotton manufactures, colored ....yards..	674,426	139,946
Cotton manufactures, uncolored ....do....	6,020,731	1,142,451
Cotton manufactures, all other	....	3,325,820
Clover seed ....bushels..	46,214	256,694
Flax seed ....do....	1	5
Linseed oil ....gallons..	21,918	34,079
Oil cake ....pounds..	75,053,925	1,932,305
Hemp, unmanufactured ....cwts..	5,328	75,245

Statement of exports, &c.—Continued

Products and manufactures.	Quantity.	Value.
Manufactures of hemp—bags		$13,026
Cables and cordage ... cwts	12,901	265,448
Hemp cloth		763
All other manufactures of hemp		200,877
Hops ... pounds	1,001,603	362,946
Hay ... tons	5,028	109,776
Ginseng ... pounds	479,974	535,883
Salt ... bushels	605,825	304,030
Beer, ale, porter, and cider, in bottles ... dozens	975	3,189
Beer, ale, porter, and cider, in casks ... gallons	89,875	33,591
Spirits, distilled from molasses ... do	1,720,049	687,334
Spirits, distilled from grain ... do	549,310	408,626
Spirits, distilled from other materials ... do	1,473,592	750,712
Spirits of turpentine ... do	1,513,225	980,699
Wine ... do	31,288	43,078
Molasses ... do	59,544	37,126
Vinegar ... do	93,694	28,819
Sugar, brown ... pounds	294,907	28,110
Sugar, refined ... do	7,835,268	817,633
Candy and confectionery		13,475
Cigars ... M	6,104	144,169
Snuff ... pounds	24,342	12,576
Tobacco, manufactured ... do	9,601,142	2,795,008
Leaf tobacco, unmanufactured ... do	184,803,065	19,620,159
Wood and manufactures of wood:		
Boards, planks, and scantling ... M feet	131,666	3,103,669
Boats and oars		179,923
Hewn timber ... tons	51,467	571,813
Laths and pickets		14,891
Masts and spars		62,913
Other lumber		1,378,713
Shingles ... M	29,747	152,427
Shooks for barrels and hogsheads		2,778,277
Shooks for boxes		699,279
Staves and headings ... M	24,565	3,081,588
Hogsheads and barrels, empty ... number	104,358	173,148
Hoops and hoop-poles ... M	12,231	659,530
Household furniture		1,052,249
Manufactures of wood not specified		930,154
Ashes, pot and pearl ... cwt	1,596,592	168,882
Rosin and turpentine ... barrels	334,104	1,984,865
Tar and pitch ... do	21,557	84,552

A recapitulation of exports of the growth and agricultural products of the United States, and their immediate manufactures, for the year ending June 30, 1867.

Animal production	$32,515,115
Breadstuffs	40,983,168
Wood and its products	17,076,873
Cotton and its manufactures	206,078,640
Miscellaneous	31,429,783
Total	328,083,579

A synopsis of statistical and general data relative to the condition and prospects of southern agriculture—a mass of which has been collected by the statistical division of this department—will be found in another portion of this volume.

J. R. DODGE.

Hon. HORACE CAPRON, *Commissioner.*

POPULAR VARIETIES OF HARDY FRUIT.

By F. R. Elliott,* Cleveland, Ohio.

The following descriptions of popular fruits have been prepared as a continuation of former articles published in the Reports of the Department of Agriculture, originally designed to be continued from year to year until the records of the Department should furnish a complete history and description of all the best fruits grown in the United States.

In making selections annually of a few varieties, out of the many hundreds known, the author has been guided by his own personal experience and extended observation, and the suggestions and opinions of many eminent, intelligent pomologists. New varieties are being constantly produced, but; except in rare cases, where all the tests have been favorable, it has not been thought best to introduce them as part of these reports, until the older and leading popular sorts have been described.

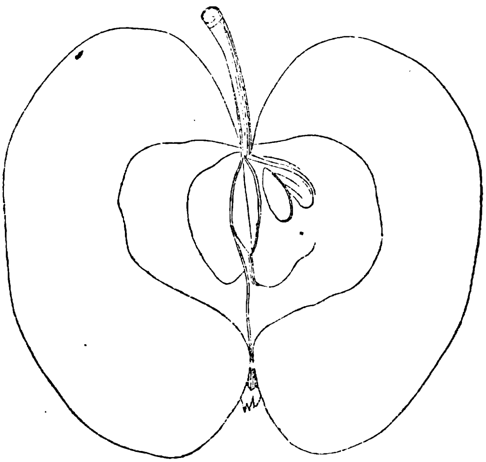
APPLES.

AMERICAN GOLDEN RUSSET.

Synonyms.—Bullock's Pippin, Sheep Nose, Golden Russet, Little Pearmain.

Fruit.—Size, small to medium; form, roundish conical, and when well grown very regular; color, light rich golden yellow, mostly overspread with a soft, warm, thin russet, and in some faintly blushed and marbled with red; stem, rather long, slender; cavity, narrow, regular; calyx, small, closed; basin, shallow, regular, sometimes slightly furrowed; flesh, yellowish, fine grained, very tender, juicy, almost buttery, mild, rich sub-acid, aromatic, sprightly; core, large for the size of the fruit; seeds, abundant, ovate, pyriform; season, November to March.

Tree.—A moderately vigorous upright grower, forming a medium-sized, round-headed orchard tree, with rather erect slender shoots, hardy and healthy, except in rich prairie bottom lands.



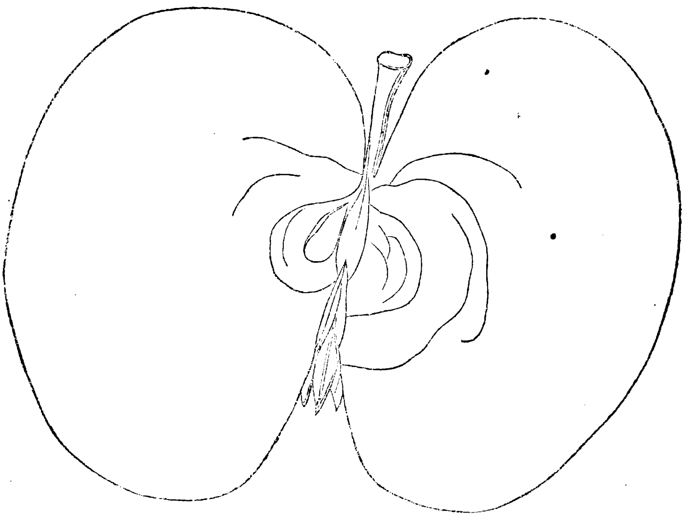
Remarks.—In quality this variety is almost unsurpassed, possessing, when well grown, a delicate, rich, pear-like flavor. At the north, except in very rich ground, however, it is liable to spot and blotch with hard fungoid spots that destroy its appearance, and partially destroy its delicacy. In the sandstone soils of the south and west, wherever it is grown, it is one of the most desirable for the table; but nowhere a profitable variety for market purposes.

* In view of an accumulation of letters from readers of these reports becoming quite burdensome, the author desires to state that he is *not* a nurseryman, nor in any way connected with the sale of trees.

CANADA REINETTE.

Synonyms.—Canada Pippin, Portugal, Canadian Reinette, Janaurea, Pomme de Caen, De Bretagne, Reinette de Grosse du Canada, German Green, Wahr Reinette, Reinette du Canada Blanche, Grosse Reinette d'Angleterre, Reinette du Canada à Cortez, White Pippin, (erroneously,) Yellow Newton Pippin, (erroneously.)

Fruit.—Size, large to extra large; form, varying, generally roundish flattened, slightly oblique, angular, much ribbed, especially toward the crown or calyx; sometimes the form is almost oblong and quite smooth; color, light greenish yellow, with frequently a faint blush of red on the sun-exposed side; many small dark green specks, surrounded with light green suffused beneath the skin; stem, short, set a little inclined on one side in a deep, open cavity; slightly russeted; calyx, with short divided half-open segments; basin, with prominent ribs; flesh, yellowish, white, juicy, crisp, tender, sharp, sub-acid, sprightly, aromatic; core, small, compact; seeds very dark brown, almost black; season, December to May.



Tree.—A very strong, vigorous, upright grower while young, forming a large spreading, open orchard tree, quite hardy, productive and profitable. An old French variety, described nearly two centuries ago.

REMARKS.—The continued vigor of tree and excellence of fruit possessed at this day by this old variety, disputes strongly all theory of natural life duration of sorts. In strong heavy soils its strong open spreading form and productiveness, together with its large-size fruit, make this variety one of the most valuable sorts for family use or home market. For distant transportation, no white or light-colored apple is found to equal those with red skins.

COGSWELL.

Synonyms.—Cogswell's Pearmain, Ohio Nonpareil (incorrectly,) Coggeswell.

Fruit.—Size, medium, often above; form, varying from roundish flattened to roundish conical, sometimes slightly oblique, very regular and uniform in general appearance; color, a rich yellow ground, mostly covered with broken stripes, splashes and dots of red, some russet specks and russet around the stem; stem, medium length, rather slender; cavity, open, regular, often russeted; calyx, medium or small, nearly closed; basin, medium depth, very slightly furrowed

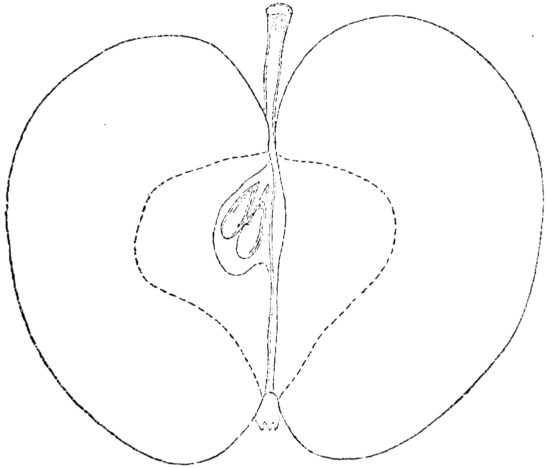
PLATE V.

CANADA REINETTE.

EARLY JOE.

regular; flesh, yellowish, crisp, juicy, sprightly, tender, aromatic sub-acid; core, small; seeds, abundant, dark brown; season, November to March.

Tree.—A moderately vigorous but healthy grower, forming a round-headed, half spreading orchard tree, with annual shoots of a dark reddish brown color. A good bearer, producing always fair and even-sized fruit. The first known of this variety was in an orchard in Connecticut, owned by a Mr. Cogswell, from whom it took its name.

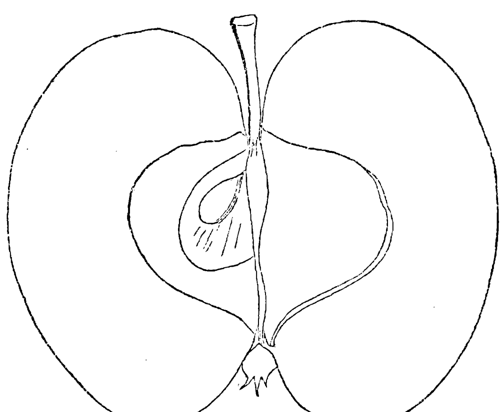


REMARKS.—Wherever this variety has been grown the tree proves as hardy as the Jonathan; and as the fruit is somewhat larger, and the tree a more upright grower, it is by many preferred; in quality, as a table apple, it ranks as best. Grown at the south or southwest it proves only a fall apple, ripening early in October and keeping only to December; but it is there much increased in size and becomes somewhat russeted.

EARLY JOE.

Fruit.—Size, below medium; form, roundish flattened, very regular; color, pale yellowish green, overspread with broken stripes and splashes of dark and pale red; stem, of medium length, rather slender, set in a deep open cavity, somewhat russeted; calyx, small, nearly closed; basin, shallow; flesh, yellowish white, tender, crisp, with a delicate rich pear flavor; core, medium, with an open centre; seeds, abundant, short, pyriform; season, July and August.

Tree.—In the nursery this a slow, stocky grower, but after becoming established in good soil in the orchard it makes moderately vigorous and healthy shoots, and forms an open spreading, rather irregular tree of only medium size. It produces very abundantly and may be noted for its dark colored foliage, as well as by its quite dark reddish brown annual shoots. Its origin is claimed for Ontario county, New York.



REMARKS.—This is one of the most delicious of all the summer apples. It is comparatively little known or grown at the west, probably from the trees growing so slowly in the nursery as to make their cultivation unprofitable.

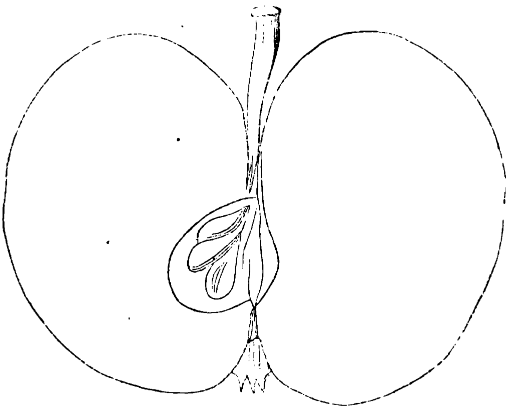
Although of small size, the trees are such good bearers, and the fruit so firm for carriage, that were it once grown and offered, its superior quality would undoubtedly make it always command a ready sale. Like all our early summer

ripening varieties, when grown at the south its size is much increased, and the tree becomes larger and stronger in its growth. No fruit grower should consider his collection complete without this variety.

ESOPUS SPITZENBERG.

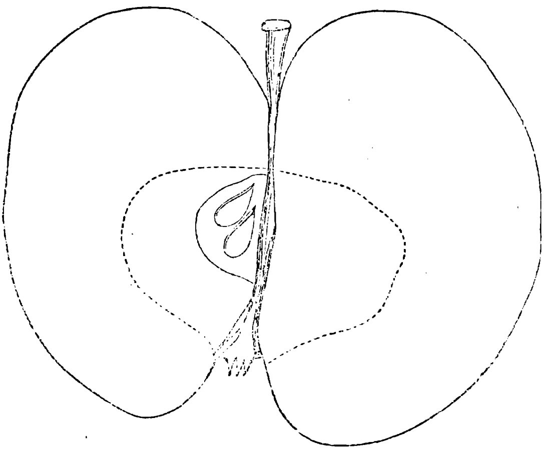
Fruit.—Size, medium to large; form, roundish oblong conical, flattened at base or stem end, considerably ribbed and irregular on its surface, and almost always slightly oblique; color, a yellowish ground mostly overspread with a rich dark lively red, with many irregular dots and small marblings of grayish yellow russet; stem, varying, from long and slender to short and stout; cavity, deep, regular and open; calyx, small, closed; basin, deep, abrupt, furrowed; flesh, yellow, a little tough until fully ripe, when it becomes breaking, crisp, abounding in a very high flavored rich aromatic juice; core, rather large, very irregular; seeds, large and long, pointed; season, December to March.

Tree.—A moderately vigorous upright slender grower while young, forming an orchard tree of rather large size, with an open spreading, but rather drooping head. Not productive while young, but when old very productive. Requires a rich strong soil. Originated on the Hudson river, New York.



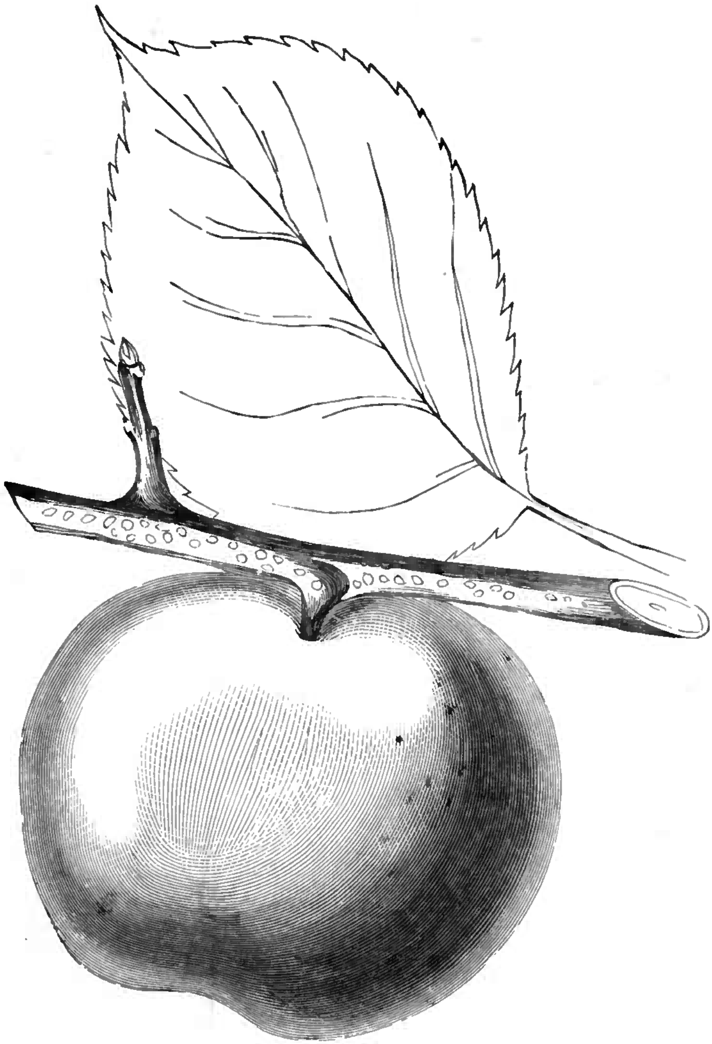
REMARKS.—The Esopus Spitzenberg has always ranked in quality among apples as the Seckel among pears. While the trees are young, it is not a good bearer, unless growing in sandy or gravelly soils, nor is the fruit as high flavored as from old trees. In some sections of the west it has been found a little tender, or rather subject to blight, which perhaps could be traced to an unsuitable soil. In all rich limestone soils, wherever I have had record of it, the trees are healthy, hardy and productive, after arriving at maturity, say fifteen to twenty years.

HIGBY SWEET.



Synonyms.—Lady's Blush, Trumbull Sweet, Fenton Sweet.

Fruit.—Size, medium or above; form, roundish, conical, flattened at ends, often one side enlarged or slightly oblique; color, clear pale yellow, with a faint tinge of red in the sun, and a few small, obscure, suffused, reddish dots; stem, medium, often short and rather slender, usually set a little on one side of an open rather deep cavity; calyx, small to medium, generally closed;



HIGBY SWEET.

basin, deep, abrupt, slightly furrowed; flesh, white, very tender, juicy, delicate, rich, sweet; core, small, compact; seeds, plump, roundish ovate, sharply pointed; season, October to December.

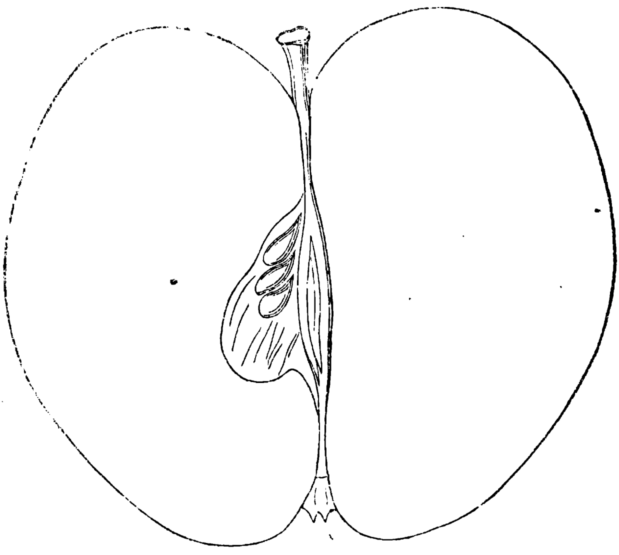
Tree.—A vigorous, healthy, upright grower while young, with moderate sized shoots. In the orchard it makes a round, regular, open head, and forms a rather large tree, producing almost annually and abundantly a fair even-sized fruit. Originated in Trumbull county, Ohio.

REMARKS.—This is, comparatively, a new variety, but a very hardy tree, productive, and one of the most delicate and pleasant of all the sweet apples. It is especially suited for table use, or for cooking, or for other uses about the homestead, but is too tender for shipment.

LADY'S SWEET.

Synonyms.—Ladies' Sweeting.

Fruit.—Size, above medium to large; form, roundish conical, generally very regular; color, pale yellowish green, mostly overspread with broken stripes and splashes of two shades of red, and many yellowish gray dots, often, unless fully exposed to the sun when growing, there is cloudy white over the red, and always a bloom on the fruit at gathering; stem, varying, generally short and stout; cavity, broad, open, not very deep; calyx, quite small, closed; basin, rather shallow or medium depth, rather abrupt, often corrugated; flesh, whitish, juicy, crisp, tender, with a sprightly, agreeable, sweet aroma; core, rather large; seeds, abundant; season, December to March.



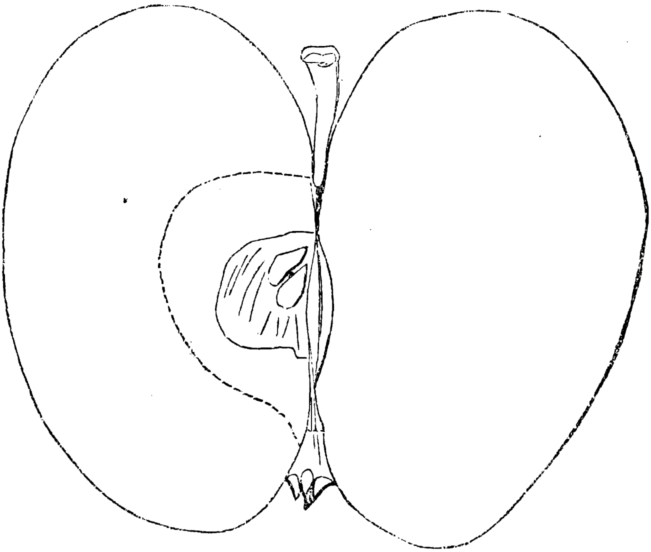
Tree.—A moderately vigorous grower while young, forming a round headed medium to large-sized tree, filled with spray, which requires judicious care in pruning or the fruit is of little value; very productive. Originated near Newburgh, New York.

REMARKS.—This variety, originally distributed by the Messrs. Charles and A. J. Downing from Newburgh, New York, is, throughout that State and many sections elsewhere, considered as one of the very best and most profitable of sweet apples. The trees prove hardy, the fruit is of fair, even, regular size, keeps well, bears carriage to market well, and is one of the best for table, cooking, or stock uses.

WHITE PIPPIN.

Fruit.—Size, large; form, roundish, oblong, slightly conical, generally regular, sometimes a little oblique; color, greenish white until fully ripe, when it becomes yellowish, or pale yellowish green, often almost lined as if striped, many

small dark green specks with suffused surrounding shades of light green; stem, generally short; cavity, deep, wide and open; calyx, rather small, with generally long closed segments; basin, deep, abrupt, somewhat furrowed; flesh, yellowish white, crisp, tender, juicy, sprightly sharp sub-acid, with a pleasant but not peculiarly rich aroma; core, small, compact; seeds, abundant, light brown; season, December to March.



Tree.—A very thrifty, upright, hardy, healthy, and vigorous grower, with strong dark brownish red shoots and large leaves, forming a large upright, spreading, open orchard tree, very productive and profitable.

REMARKS.—The origin of the White Pippin is as yet unknown. It can be traced only to the earliest nurseries and orchards in southern Ohio, from whence it has been largely distributed, and generally proved profitable. Like other varieties of winter fruits its size is somewhat increased when grown far south, and its keeping qualities reduced, so that it is rarely found south of Kentucky later than January or February, while in the north part of Ohio and New York it often keeps until May and June.

SUMMER ROSE.

Synonyms.—Woolman's Harvest, Lippincott.

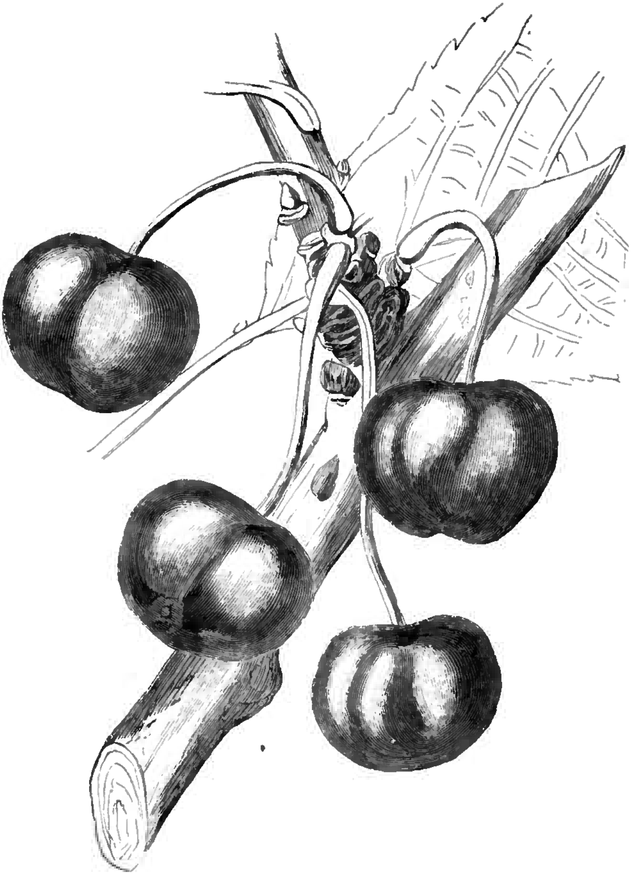
Fruit.—Size, below medium; form, roundish, flattened, regular; color, glossy pale yellow, blotched and splashed, and streaked with two shades of rich red, few minute dots; stem, varying from stout to slender; cavity, narrow, pretty deep; calyx, with recurved segments partially or quite closed; basin, broad, open, pretty deep, slightly furrowed; flesh, fine grained, white, tender, crisp, juicy, sprightly, agreeable, sub-acid; core, medium to large; seeds, abundant, short, plump, full, round, ovate; season, July and August.

Tree.—A vigorous, healthy grower, with short jointed stout shoots, forming a small or medium sized orchard tree, with an irregular spreading head; very productive. Originated in New Jersey.

PLATE VIII.

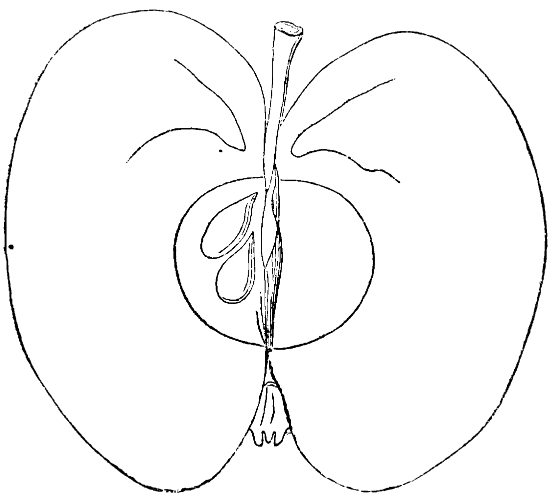
SUMMER ROSE.

Fig. 1. KIRTLAND'S MORELLO.
Fig. 2. ARCH DUKE.



BLACK EAGLE.

REMARKS.—Where-ever grown the Summer Rose proves one of the most desirable of early summer fruits for family use. It is an early bearer, continues a long time in ripening, much longer than most of early varieties, and although not quite as rich in quality as Early Joe or Garden Royal, it nevertheless has a sprightliness that makes it always admired, and fits it well for the dessert or for cooking. It is valuable as a market sort where quality is ranked before size.



CHERRIES.

ARCHDUKE.

Synonyms.—Griote de Portugal, Portugal Duke, late Archduke, late Duke, (incorrectly.)

Fruit.—Size, large; form, round, heart-shaped, compressed; color, dark, shining red; stem, long and slender; flesh, light red, slightly adhering to the pit, tender, sub-acid, rich, and very good; season, early in July.

Tree.—A vigorous, healthy, upright grower, with long, broad oval, dark rich green foliage, slightly serrated, and the petioles a little bronzed. Old bearing trees become slightly pendulous, but the general habit is quite upright. It is an old English variety, first described by Lindley.

REMARKS.—Of all the varieties of the Duke cherries the Archduke is decidedly the best, being more vigorous, quite as hardy, very productive and ripening its fruit evenly. In sections where the more tender class of sweet cherries fails to succeed, this variety supplies a want, and offers superior claims to cultivation. The true variety is somewhat rare, as the common late Duke is often sold for it.

BLACK EAGLE.

Fruit.—Size, above medium to large; form, obtuse, heart-shaped; surface, smooth, even, regular; color, reddish purple, becoming nearly black at maturity; stem, medium length, rather slender, inserted in a round regular basin; flesh, deep purple, almost or quite tender, with a rich high flavored juice, superior to any other black cherry except Black Hawk; season, early in July.

Tree.—A short jointed, stout, strong grower, with large leaves, producing only moderately while young, but abundantly when the trees have acquired some age The fruit is borne in pairs and threes. It is an English variety, originated by the daughter of Mr. Knight, in 1806, from seed of the Bigarreau fertilized by the May Duke.

REMARKS.—This is one of the richest in quality of all the sweet cherries, and also one of the most hardy trees. Its unproductiveness while young has almost thrown it out of cultivation, but it is a variety that should be retained, and one or more trees planted in every orchard for family use.

KIRTLAND'S MORELLO.

Synonyms.—Large Morello, Kirtland's large Morello.

Fruit.—Size, large for its class ; form, roundish ; color, rich shining dark red; flesh, tender, juicy, acid, rich, high flavor; stem, rather short, inserted in a narrow round basin—borne in pairs ; pit, quite small ; season, early in July.

Tree.—A vigorous, rapid grower, spreading, and, like all the Morellos, a little drooping yet upright, forming a very handsome tree of something above the ordinary range of its class. The wood appears to be combined with Duke and Morello, while the leaf is strictly Morello. Originated by Professor J. P. Kirtland of Ohio.

REMARKS.—In sections of the southern and western States, where the sweet cherries are unsuccessful generally, this variety is one of the best, in connection with the Early Richmond, Louis Philippe, and others, to form the orchard. It is not a great bearer, but its fruit is evenly distributed over the whole tree, and is of uniform size, large, very handsome and good.

OHIO BEAUTY.

Fruit.—Size, large ; form, round, obtuse heart-shaped, sometimes nearly round ; suture, slight ; color, yellow, light ground, mostly overspread, and somewhat marbled with dark, rich, and pale reds ; stem, rather long and slender, and set in a deep open basin ; flesh, yellowish white, tender, juicy, delicate sweet, with a rich fine sprightly flavor ; pit, small, oval ; season, last of June.

Tree.—A healthy, hardy, vigorous, rather short-jointed grower, forming a round open headed tree, that comes very early into bearing and produces abundantly. Originated by Professor J. P. Kirtland, of Ohio, in 1843.

REMARKS.—This variety was first sent out in 1847, and, so far as I can learn, wherever it has been grown has proved superior to the claim made for it by its originator. In no place that I can learn of has the tree ever shown any sign of disease, and it is reported as being grown successfully where the Black Tartarian and Elton have failed.

NECTARINES.

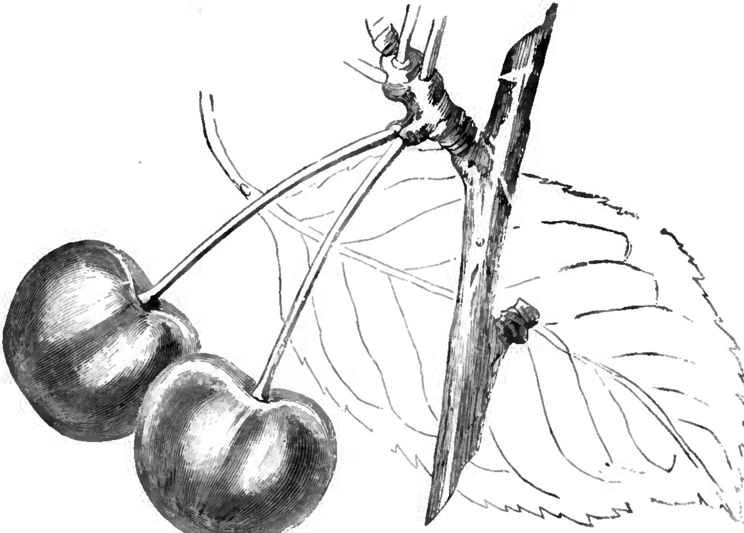
ETRUGE.

Synonyms.—Common Etruge, Anderson's, Oatland's, Claremont, Temple, Spring Grove, Peterborough, (incorrectly.)

Fruit.—Size, medium to large ; form, roundish, inclining to oval ; suture, deepest toward the apex ; skin, smooth, of a pale greenish ground, becoming, when well ripened in the sun, nearly covered with a deep violet or blood red, distinctly dotted with minute brownish specks ; flesh, greenish white, slightly stained with pale red next the stone, from which it separates freely, very juicy, melting, rich, and high flavored ; stone, medium size, oval, slightly pointed, quite rough and of a pale color ; season, early in September.

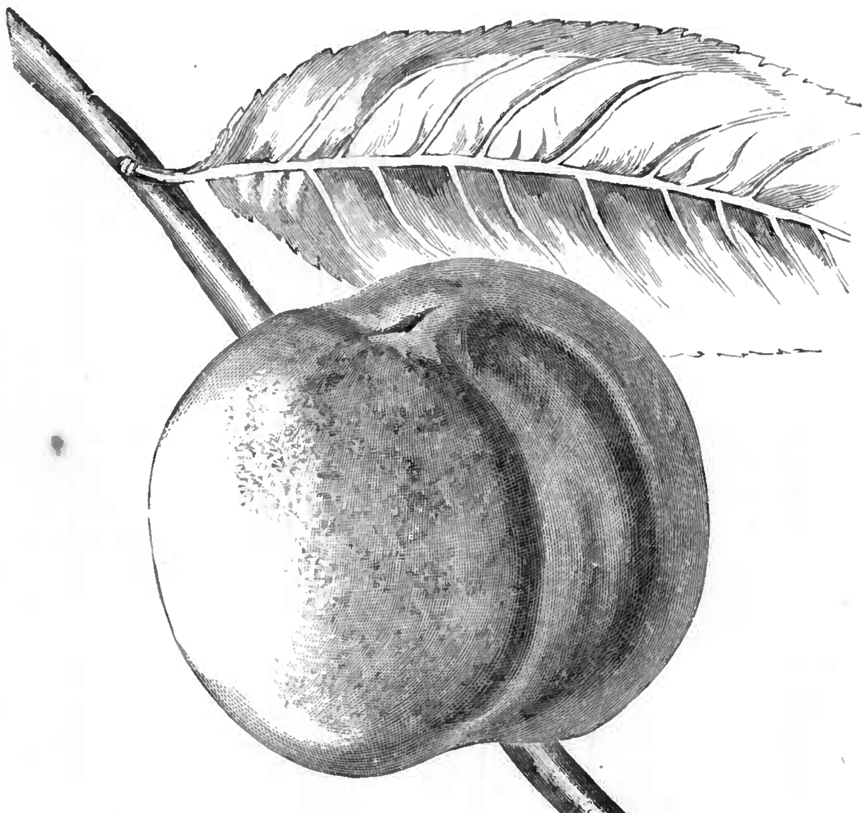
Tree.—The tree is a vigorous, hardy and healthy grower, with crenated leaves having uniform glands ; flowers, small, and of a pale dull red ; of English origin.

REMARKS.—The nectarine is one of the choicest of our stone fruits, and the trees are as easily grown and more hardy than the peach, while to insure the crop of fruit no more care is requisite than to insure that of the plum—the curculio being the only obstacle to success. The variety figured and described here is one of the very best and hardiest.



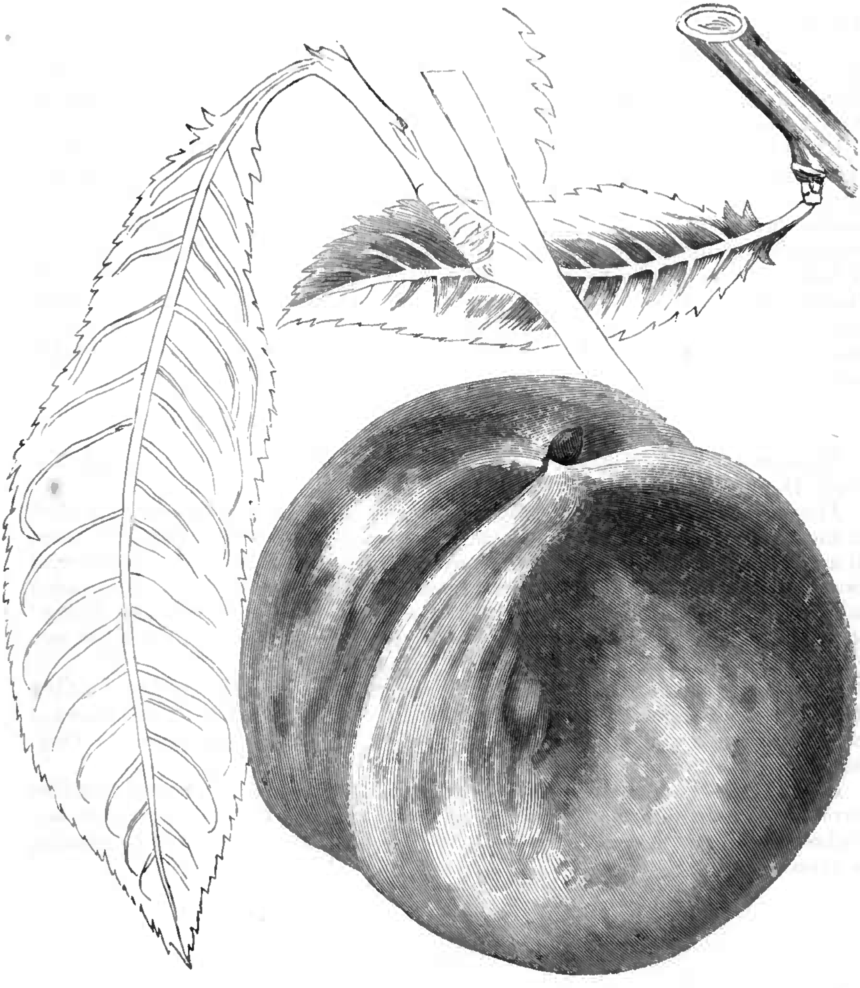
OHIO BEAUTY.

ELRUGE.



GEORGE THE FOURTH.

PLATE XIV.



NOBLESSE.

PEACHES.

GEORGE THE FOURTH.

Fruit.—Size, medium to large; form, roundish, divided by a broad deep suture, making one half appear larger than the other; skin, yellowish white, dotted with dark bright red, and shading into a rich dark red cheek where fully exposed to the sun; flesh, whitish, pale red next the stone, melting, juicy, with a rich, luscious flavor; stone, small, separating freely from the flesh; season, last of August.

Tree.—A moderately vigorous grower and regular, uniform, moderate bearer, producing its fruit evenly distributed and all of unqualified excellence. The flowers are small and the leaves have obscure globose glands. Originated in New York city.

REMARKS.—Although the peach, like the strawberry, may be termed an evanescent fruit, yet there are a few old varieties whose excellent qualities surpass all those of more recent origin, of which is the one here described. It is not a profuse bearer, and hence its buds are so generally well perfected that it often sustains uninjured a greater degree of cold than many other varieties, and when it fruits all the specimens are nearly equally good. The large Early York, Haines's Early, Walters's Early, and one or two more popular market sorts, undoubtedly sprung from this; and while possessing some superior qualities for market orchard, have none of them the richness and delicacy of this sort for table use.

NOBLESSE.

Synonyms.—Lord Montague's Noblesse, Mellishe's Favorite, Vanguard, Noblest, Double Montague.

Fruit.—Size, above medium to large; form, roundish, sometimes with a hollow at the apex and a small point. Sometimes it is roundish oblong, and the point at apex quite prominent. Skin, pale greenish white, marbled and streaked with two shades of dull red in the sun, occasional faint blotches of red on the shaded side; flesh, greenish white, very juicy, melting with a rich, delicious flavor; stone, large, obovate, pointed, separates freely from the flesh, and without any stain of red; season, early in September.

Tree.—A moderately slow grower at the north, and somewhat liable to mildew when not in good ground. At the south it grows more vigorously, and does not mildew. The flowers are large and the leaves serrated without glands. Originated in France.

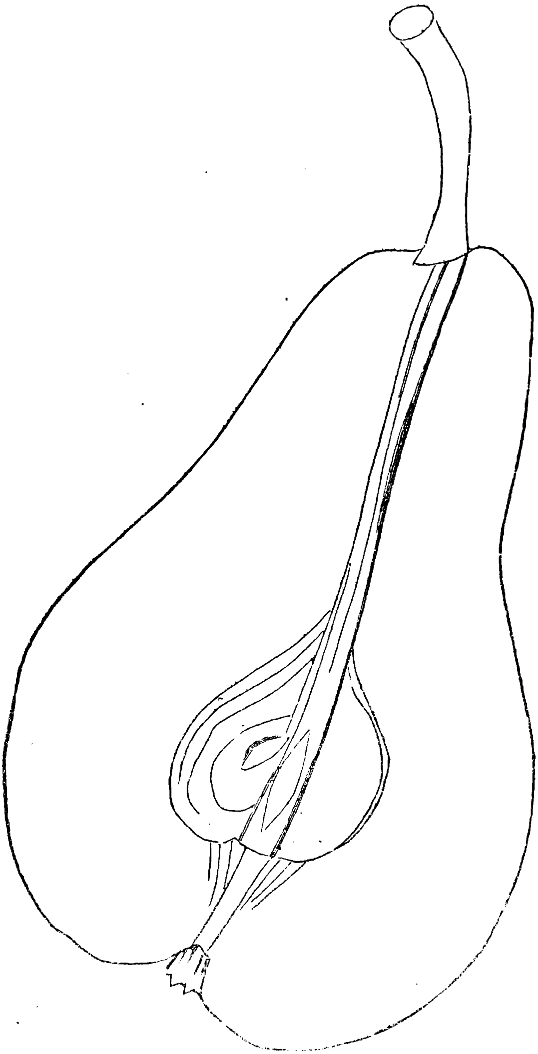
REMARKS.—The Noblesse is one of the old varieties, whose good qualities have as yet been unsurpassed by any of recent origin. It is of the richest and highest flavor, and being entirely white at the stone, is quite desirable for canning or preserving.

PEARS.

DIX.

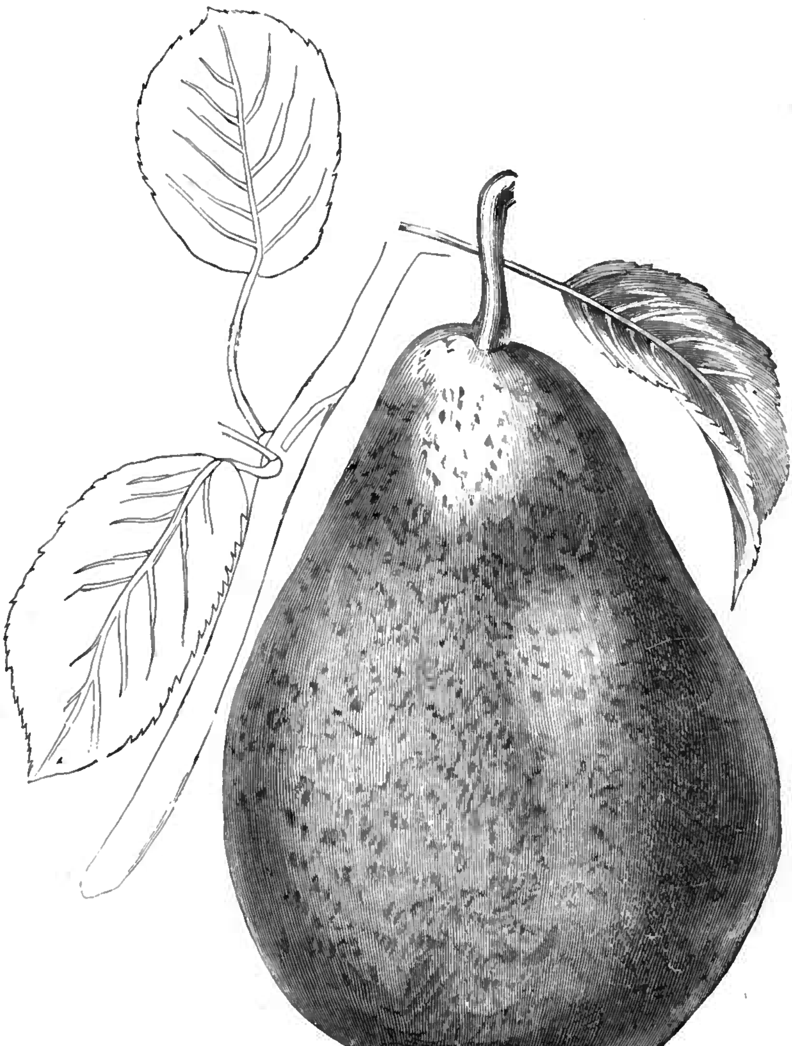
Fruit.—Size, large; form, oblong, pyriform; color, pale yellow, becoming deep yellow when well matured, with many distinct irregular-sized russet dots and patches, and considerably russeted around the stem; stem, rather short, stout, thickest at each end, set obliquely or with a raised lip on one side, with little or no depression; calyx, small for the size of the fruit; basin, shallow; flesh, yellowish white, moderately fine-grained, juicy, melting, rich, sweet, slightly perfumed; core, marked with a dark, gritty circle, and the same extending toward the stem; season, October and November.

Tree.—A vigorous, upright grower, with pale yellow, slender shoots, sometimes thorny, quite hardy, unproductive while young, but an abundant bearer when the tree becomes of mature age, say 10 to 15 years from planting; originated in Boston, Massachusetts, in the garden of Madam Dix, and fruited for the first time in 1826.

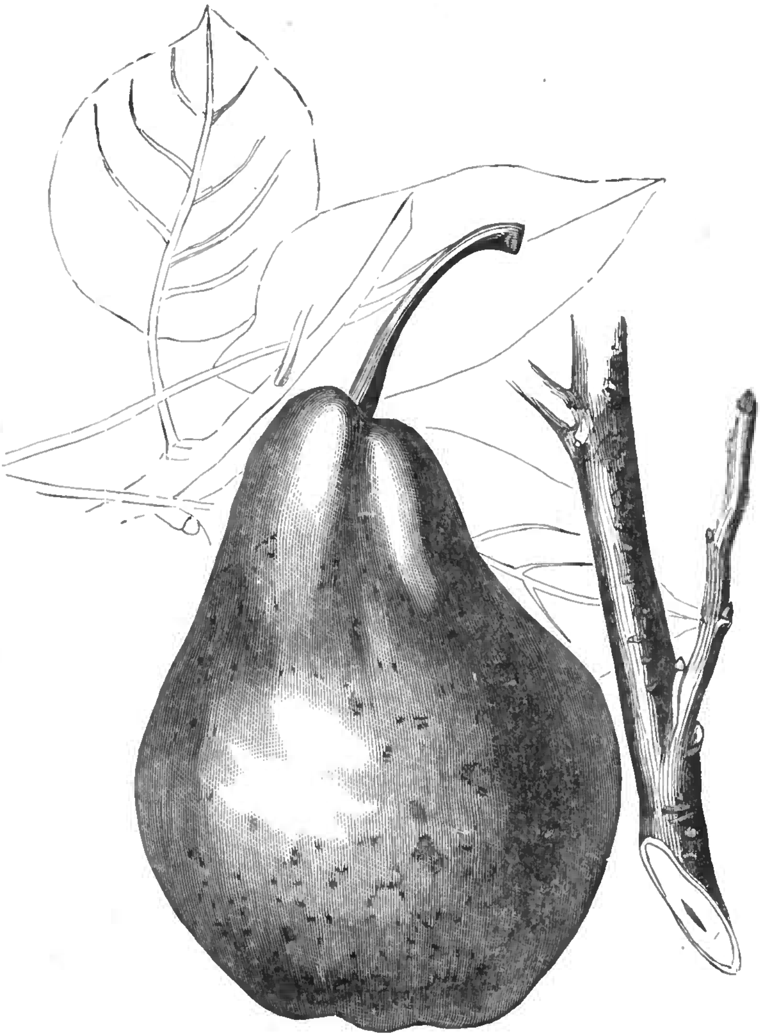


REMARKS.—Although the Dix is comparatively a long time before coming into bearing, so far as I can learn it proves an earlier bearer and a better fruit south than in its own locality; and such is its vigor and hardihood that it is yet one of the most valuable sorts for extensive orchard planting; for, when it once commences bearing it produces abundantly, of a regular, even, large fruit, desirable for table or market.

PLATE XV.



DIX.

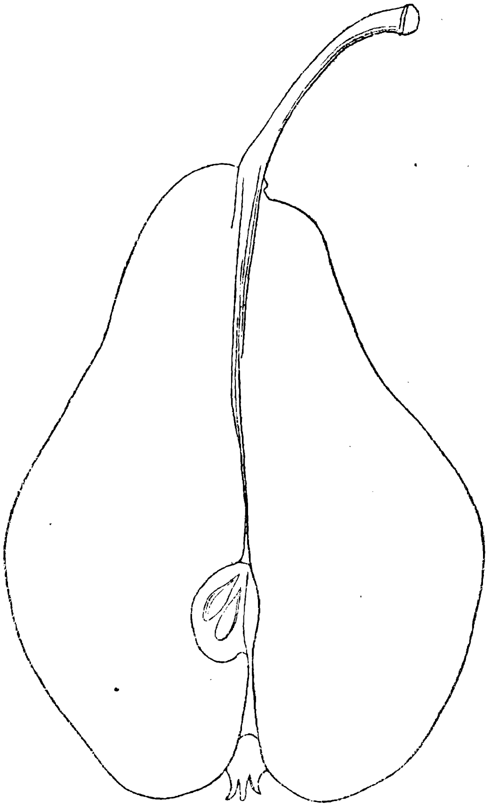


PARADISE D' AUTOMNE.

PARADISE D'AUTOMNE.

Synonyms.—Autumn Paradise, Calebasse Bosc, Maria Nouvelle, Princess Marianne.

Fruit.—Size, large; form, obovate, obtuse, pyriform, with an irregular, uneven surface; color, dull yellow, mostly overspread with a bright cinnamon russet, deepening on the sunny side; stem, rather long and slender, largest at ends, and obliquely attached to the fruit by fleshy wrinkles, without depression; calyx, rather large, open, with reflexed segments; basin, abrupt, furrowed; flesh, yellowish white, slightly granulous, juicy, buttery, melting with a delicious, rich, vinous, aromatic flavor; core, small; seeds, full, long, pointed; season, September and October.



Tree.—A vigorous, strong grower, with long, reddish brown shoots, dotted with many large, whitish gray specks; at first the tree is quite upright, but it soon becomes half pendulous, spreading, open, and rather straggling; an early and very abundant bearer; of foreign origin.

Remarks.—As a standard orchard fruit, the Paradise d'Automne is by many eminent pomologists regarded as even superior to the Beurre Bosc, which it somewhat resembles both in tree and fruit. It is a variety that as a standard comes early into bearing, and produces abundantly a fruit that in quality has few to surpass it.

THE FRUITS OF FLORIDA.

BY GEO. W. ATWOOD, ST. AUGUSTINE, FLORIDA

In considering the subject of this communication, the writer would premise that comparatively few among our own people are aware that within less than 60 hours' travel by railroad from New York city, in our own country, there exists a fairy-like land of fruits and flowers, not less beautiful, inviting, or attractive than that described by the dramatic poet in his picture portraying the romantic and blissful abode which the ardent lover had prepared for his mistress upon the shores of the Lake of Como, and whose balmy breezes and delightful atmosphere are ever redolent with the odorous perfumes of fragrant flowers, and ever-expanding blossoms of the orange, and where

> "the lemon, orange, and the lime,
> Amid their verdant umbrage countless glow
> With fragrant fruits of vegetable gold;"

and where all the semi-tropical fruits, as the orange, the lemon, the lime, the citron, the olive, the fig, the pineapple, the banana, the guava, and the palm are produced in greater perfection of quality, flavor, size and form, than in the more tropical climate of the West Indies and Brazil, and with less care and attention, and with greater exemption from the vicissitudes of climate and the hazards of injury from the insect tribe, than are the common fruits of the north, as the apple, the pear, the peach, or the plum.

Nearly every forest and woodland, south of 30° north latitude, abound with groves of the wild orange, some of which are of enormous extent.* It is from these sources that the numerous groves of sweet oranges, limes, lemons, and citrons are collected, by digging the wild trees of the sour and bitter-sweet varieties in the forests and hummocks, and transplanting them into groves, at uniform distances, where the new shoots are permitted to grow, and are then budded with the sweet orange, lemon, &c., and thus are established groves of every desired variety intended for the supply of the market.

Whether the orange was introduced into Florida by the early Spaniards, or some unknown previous race, is yet a mooted question, and would require more space than the limited character of this article would admit to give the views of the writer, or the different theories of others on the subject.

The orange or *Citrus* family of fruits, comprising all the varieties of the orange, citron, lemon, lime, and shaddock, numbers more than 100 known varieties.

Dr. Sickler, who spent six years in Italy, and paid great attention to the kinds and culture of the *Citrus* family, published at Weimar, in 1815, a quarto volume, called Vollkommene Orangerie Gartner, in which he describes 74 sorts. He arranges the whole into two classes, and these classes into divisions and subdivisions, without regard to their botanical distinctions or species, as follows:

Lemons—

Cedrats, or Citrons		4 sorts.
	Round lemons	6 sorts.
	Pear-shaped lemons	11 sorts.
	Cylindrical lemons	4 sorts.
	Gourd-shaped lemons	2 sorts.
	Wax lemons	5 sorts.
	Lumies lemons	8 sorts.

*The writer of this visited one of these groves in east Florida, said to be 10 miles long, and varying from half a mile to a mile in width.

Cedrat, lemons or citronats	6 sorts.
Limes	4 sorts.
Oranges—	
Bitter oranges	6 sorts.
Sour oranges	6 sorts.
Sweet oranges	12 sorts.

Few other classes of fruits are more easily propagated than the citrus, and all of the species may be rapidly increased and produced either by seeds, cuttings, layers, grafting, or budding; the lime being the most difficult, and the citron the most easy of propagation. They differ from deciduous fruits in the respect that like always produces like, the seed of every variety invariably producing its kind. Cuttings of thrifty wood, two years old, strike fibres as readily as younger wood, though the mode of propagating almost universally adopted in Florida is by budding upon young stocks from the nursery, or from the larger stocks obtained from the forests. The citrus family of fruits is supposed to have originated in the warmer parts of Asia, and to have derived its name from the town of Citron, in Judea, though it has been cultivated from time immemorial in middle and southern Europe, and is now cultivated almost throughout the world, and in no higher degree of perfection than in east Florida, south of the 30° north latitude.

THE ORANGE, *(Citrus aurantium.)*—The cultivation of the orange in east Florida, previous to 1835, had attained a degree of considerable commercial importance, and the exports of this fruit from the small city of St. Augustine are said to have amounted to $100,000 annually.

On the St. John's river, and in some parts of west Florida, as at Tampa bay, groves were being established as a source of commercial supply; the west coast is not considered as favorable for the cultivation of this fruit, on account of its rough winds, as is the east coast.

In February, 1835, a very severe frost visited the State, and most of the orange groves and other semi-tropical fruits were destroyed, or nearly so, leaving only the stumps and roots to spring again. Many of these sent up shoots, and began to encourage hopes of returning prosperity to this branch of industry. These hopes were not permitted to be realized, however, for, in 1842, an insect called the *orange coccus*, or scale insect, appeared in the orange groves, and spread with great rapidity over the whole country, almost totally destroying every tree attacked. This terrible calamity continued for 10 or 12 years, and bid defiance to almost every effort made to stay its blighting force. Many became discouraged in the contest and abandoned further attempts to re-establish this heretofore agreeable and profitable branch of industry. In 1853, however, the insect began to decrease in numbers and finally disappeared, since which time most of the groves now in the State must date their birth; although there are probably not now 50 bearing trees, where there were 1,000, (some of which were 100 years old,) prior to the great cold of 1835, when the mercury fell below zero, yet a new interest is being revived in the cultivation of this fruit, and new groves, probably not less than 50,000 trees, have been planted in east Florida since the close of the rebellion.*

The orange from the seed produces fruit in from 7 to 10 years, depending upon situation, culture, &c. Groves made from wild stocks, usually cut off at a height of three to four feet from the ground, and the new shoots budded, generally produce fruit in three years. The number of oranges produced from a single tree varies from 100 to 10,000, according to the age, situation, and treatment of the tree. The trees are usually set 20 feet apart, and an acre will contain about 100 trees. Florida oranges were usually sold, previous to 1835, at $7 50 to $10 per thousand. Now a demand exists for twenty times our present

*A more recent writer in Florida estimates that from 75,000 to 100,000 orange trees were transplanted and budded last year: and at least 150,000 since the close of the rebellion.—ED.

supply, at $15 to $20 per thousand, as they hang upon the trees. The present number of bearing trees in east Florida probably does not exceed 10,000.

THE LEMON is produced in east Florida to a degree of perfection far surpassing the same fruit grown in the West Indies, Sicily, Italy, or Spain, and persons familiar with this fruit in those countries are rather disposed to discredit the statement that the lemons of Florida are of the same variety of fruit.

The writer has a Sicily lemon tree in his garden, which, last season, produced many lemons that weighed 2¼ pounds each; and it is not an unusual circumstance to pick from the same tree lemons weighing 1½ to 1¾ pounds each.

The lemon, lime, citron, and shaddock are all produced and propagated in Florida in the same manner as the orange, and of a quality superior to those of other countries.

THE LIME, (*Citrus limetta.*)—There are five of the acid varieties of this fruit named in English nursery catalogues. The juice of the lime is preferred to that of the lemon, as being more wholesome and agreeable.

THE CITRON, (*Citrus medica.*)—This fruit is commercially known in the United States as a preserved confection, imported from the Mediterranean in oblong boxes, weighing 20 to 25 pounds each, and used by families as an addition to fruit cake, pies, &c. It is a native of the warm regions of Asia. Heretofore but little attention has been paid to the cultivation of this fruit in Florida, except for variety and ornament, and it is not usual to observe more than one or two trees in a large garden of several acres in extent, though it is grown here with the greatest ease and perfection, frequently producing fruit weighing 10 pounds, and there is no doubt but that it may be cultivated, preserved, and introduced into our home markets as an article of commerce, with great profit to the producer. There is no other variety of this species so easily propagated, and none more hardy, or that yields its fruit so quickly, or produces more abundantly; and the circumstance that both the fruit and the sugar for preserving it are produced in the same field, with equal facility, gives to the American cultivator a great advantage over the foreign producer in our market. The citron prepared and preserved by private families in Florida for home use is of much finer quality, lighter colored, and more transparent than the imported.

The writer supposes that the citron fruit may be profitably grown and sold here in its green state at four to five cents per pound. The price of sugar in Florida, before the war, ranged from four to six cents per pound, and at the same period the wholesale price of the imported citron in New York from 15 to 20 cents per pound, and now in the same market the price is about 25 cents per pound.

It will be apparent to most persons that the cost of preparing this fruit for market on a large scale need not be great, and that the combination of two articles, green citron and sugar, the cost of producing which does not exceed one-half their actual value, where the two are combined, must leave a large margin of profit to those who engage intelligently and with proper facilities in the business of cultivating and preparing this article for market.

The writer has several citron trees in his garden which produced fruit in one year from the bud in the stock of the sour or wild orange.

THE SHADDOCK, (*Citrus decumana.*)—A native of India or China, is now cultivated in all warm climates, and is called Arancio Massino by the Italians, Oranger Pampelmouse by the French, and sometimes in this country Mock-orange, or Forbidden Fruit. It was brought from China to the West Indies by Captain Shaddock, from whom it derives its present name. There are at least six varieties, only one of which is useful or desirable as a fruit. Some of these attain a very large size, frequently weighing 10 to 14 pounds. It is chiefly used for ornament or show, and where several sorts of oranges are presented at dessert it forms a striking addition to the varieties in the way of contrast.

The most desirable variety of this fruit is sometimes called Grape Fruit. It possesses a reddish pulp, with most agreeable sub-acid sweetness, and is excellent

for quenching thirst; and from the thickness of its rind will keep longer than the fruit of any other of the citrus family. This variety is well worth cultivating for the excellence of its solid vinous pulp, which furnishes a substitute for other acid fruits in pies, tarts, jellies, &c.

LOQUAT, (*Eriobotrya Japonica.*)—This fruit is known in the south as the Japan plum. The tree is an evergreen, and grows 10 to 20 feet high, and is desirable in every southern garden on account of its hardiness, withstanding a greater degree of cold than any of the semi-tropical fruits. It ripens its fruit in February and March, when most other fruits are gone; is a profuse bearer, and is readily propagated by seeds and cuttings.

PINE-APPLE, (*Ananassa sativa.*)—This fruit is grown in some of the gardens at St. Augustine, but at a point so far north that some slight winter protection is necessary. At Cape Carnaveral, 100 miles south of St. Augustine, it is produced in great excellence and perfection, the pines frequently weighing 9 and 10 pounds each.

This fruit is easily propagated from suckers and crowns, the former preferable, however, the fruit maturing in three to four months after planting the suckers.

PAPAW, (*Carica papaya.*)—The fruit of this tree is sometimes called the Bread-fruit, and is a native of South America. This remarkable tree, though not much cultivated at the present time in Florida, is worthy of greater attention, not only for the excellence of its fruit, but also for its other extraordinary properties. The tree attains a growth of 20 feet in height, and yields a large supply of fruit in three years from the seed, and should be in every garden in Florida south of 30° north latitude. It thrives well and bears profusely at St. Augustine. The fruit is pear-shaped, of a light yellow color, varying in size from three to five inches in length and from two to four inches in diameter, and is not unlike a very ripe muskmelon in taste and flavor, though sweeter. It may be pared and sliced and eaten raw as a dessert fruit, or cut into slices and soaked in water till the milky juice is out, and then boiled and served as a sauce, or, by the addition of lemon or lime juice, it supplies a most excellent substitute for apple sauce or tart fruit, to which it is scarcely inferior. The juice of the pulp also forms an excellent cosmetic for removing freckles from the skin, and the leaves are frequently used, in the French West India islands, instead of soap for cleansing linen. Its remarkable medical properties, however, are most important, as it is the most powerful vermifuge known, a single dose of the milky juice of the unripe fruit, or of the powdered seeds of the ripe fruit, being sufficient to cure the worst cases, and extirpate every worm from the system of the patient.

The most extraordinary property of the papaw tree is that related by Dr. Browne, in his Natural History of Jamaica, in which he says that the toughest meat or poultry may be made perfectly tender for cooking by steeping for eight or ten minutes in the milky juice of this tree. Dr. Holden, who witnessed its effects in the island of Barbadoes, says, in the third volume of the Wernerian Society's Memoirs, that the juices of this tree cause a separation of the muscular fibre in meats that have been immersed therein, and that the vapor of the tree serves the same purpose, it being a common custom with the inhabitants to suspend joints of meat, poultry, &c., in the upper branches of the trees to soften and prepare them for cooking. Thompson, in his System of Chemistry, makes an extract from a French work on chemistry entitled *Annales de Chimie*, which states that "fibrine had been previously supposed to belong exclusively to the animal kingdom, but that this tree had been found to contain this substance."

The papaw tree is a perpetual bearer of fruits and flowers, or blossoms, and yields enormous quantities of fruit, a single tree supplying enough for a large family.

CUSTARD APPLE, (*Anona reticulata.*)—Sometimes called sugar apple. There are upwards of forty varieties of this fruit, and nearly all the species are edible. Almost every tropical country lays claim to its own favorite variety. In Peru

it is greatly esteemed, and considered not inferior to any other fruit in the world. The species derives its English name, Custard Apple, from the consistence of the pulp of the fruit, and its rich color, fragrant odor, and handsome appearance, are well characterized in the expression, "Apples of gold in pictures of silver."

The Spanish-American Cherimoyer, *(Anona cherimolia,)* and the West India Soursop, *(Anona muricata,)* Sweetsop, *(Anona squamosa,)* and Alligator Apple, *(Anona palustris,)* are of this genus.

This delicious fruit is produced in excellent perfection as far north as St. Augustine, and is easily propagated from seed.

FIG-MARIGOLD, *(Mesembryanthemum.)*—Of this genus of fruit, there are upwards of 340 different species described by botanists, the larger portion of which are natives of the Cape of Good Hope. Probably not more than ten or twelve varieties are known and cultivated in Florida.

The ease with which this excellent fruit is propagated, and its great productiveness, yielding two annual crops in southern Florida, and always bearing abundantly throughout the State, should be a sufficient inducement for the extension of this branch of horticulture for the supply of our home market at least.

It is easily propagated from cuttings and seeds.

GUAIAVA, (*Psidiumguaiava.*)—The name, Guaiava, is a corruption of the Spanish word *guayaba.* Of this fruit there are 17 different species. It is an evergreen tree or shrub, and indigenous to Brazil, Spanish America, and the West Indies. It is propagated by cuttings and seed, and is sometimes liable to injury from severe frosts north of 29° north latitude, but south of that line it is ever bearing, yielding its delicious, aromatic, and wholesome fruit all the year round. Only three or four varieties are known and cultivated in Florida.

In the island of Cuba, and in Brazil, the varieties produced are more numerous, and large quantities of the fruit are made into jellies for exportation to all parts of the world.

The fruit of the common Guaiava is pear-shaped, of the size of a large hen's egg, and sometimes larger, and has a smooth, pale yellow skin, enclosing a many-seeded pulp of delicious acidity. In some varieties the pulp is of a light cream, and in others a pale reddish color.

This fruit is greatly esteemed wherever known, and being slightly astringent, as well as mucilaginous, is very beneficial in bowel complaints.

The roots and leaves are also astringent, and are regarded as excellent for strengthening the stomach and bowels.

The plant is propagated by seeds, cuttings, and suckers.

POMEGRANATE, (*Punica granatum.*)—This delicious shrub, or bush-like tree, is a native of Persia and Syria, and grows wild in those countries. It is perfectly hardy in all parts of Florida, and as far north as Hilton Head, South Carolina, and is widely cultivated and much esteemed in this State for the excellence of its fruit, as well as for the medicinal properties of the rind and the flowers, which are not only an excellent febrifuge, but powerful astringents, and often used with great benefit in cases of diarrhœa. The pulp of the fruit is a delicious sub-acid substance, similar in taste and flavor to the red currant, and is excellent for allaying heat and quenching thirst, and is gently laxative.

The fruit of the pomegranate is spherical, the size of an orange, with a gourd-like shell or rind, which is filled with seeds, enclosed in membranous cells and surrounded with a juicy, reddish pulp.

There are several varieties of this fruit, comprising early, medium, and late.

The early and the medium varieties have a pale yellow skin or rind, with a beautiful tinge of red upon the side or cheek, and are sparsely dotted with fine pippin-like spots. The later sorts have a dark russet-colored rind, and the seeds are of a pale pink color.

This tree bears a beautiful urn-shaped scarlet flower; and there is no tree more showy than the pomegranate when in flower.

The fruit begins to ripen at St. Augustine, Florida, about the middle of July, and continues till the middle of December. It bears transportation well on account of its hard rind, keeps for several weeks after it has been taken from the tree, and no doubt may be made a profitable market fruit.

It is increased by cuttings, layers, and suckers, and thrifty wood two years old will strike fibres as readily as younger wood.

BANANA, (*Musa paradisiaca.*)—Of the banana and plaintain, (*Musa sapientum,*) there are several species. They are increased by suckers, and require a rich, moist soil, with warm exposure. Some varieties of these plants are successfully cultivated as far north as Fernandina, in 30° 45′ north latitude. The best variety for cultivation north of 28° north latitude is the one known as *Musa paradisiaca cavendishii.* This is the most hardy, and seldom attains a height above eight feet, while the more tender kinds often grow twenty feet high. When the plant is fruiting, and all the flowers are set, it is advisable to cut off the spadix an inch or two above the last tier of perfectly formed fruit, in order to hasten and perfect the remaining fruit.

There are few more excellent or delicious dessert fruits than the banana, and, as a food plant, its importance and value, as compared with other food plants, can hardly be over-estimated. In an economical point of view it has never been appreciated in Florida, where but little attention has been given to its cultivation. When it is realized that a plantation of bananas once established has never to be renewed, and that one acre of this fruit will produce as much food as 130 acres of wheat, or 45 acres of potatoes, its value and importance will be readily acknowledged.

As this plant is a great feeder, and when once planted lasts for a lifetime, it is of the utmost importance that plantings should be made upon strong, rich soil, or that the plants be kept highly manured, to secure permanent supplies of the best fruit.

In Brazil and other tropical countries plantations are formed by setting the plants twenty feet apart; but as the kinds usually planted in those countries are of a larger species than those recommended for northern Florida, plants of the *Musa paradisiaca cavendishii* variety should be set ten feet apart each way, and in a good soil they will soon cover the ground, as they increase rapidly under favorable circumstances. Each plant produces one, and only one, bunch of bananas, when it is cut down with a sharp spade or axe to give place to succeeding plants.

When the enormous yield of this fruit is considered, and it is taken into account that when once properly planted it needs no other attention than simply gathering the fruit, and that at reasonable prices the demand would be almost unlimited, it is evident that its cultivation could be made very profitable.

DATE PALM, (*Phœnix dactylifera.*)—This excellent and valuable fruit is cultivated with entire success south of 28° north latitude, and the tree often perfects its fruit as far north as 30° north latitude. Numerous large and beautiful specimens of this tree may be seen in the gardens at St. Augustine. It is one of the most beautiful trees of the vegetable kingdom. Its long, graceful, ever-verdant, ever-waving, ever-changing branches make it the most picturesque of all others for landscape gardening, and should adorn the grounds of every homestead in Florida.

The fruit is greatly and justly esteemed by the inhabitants of Egypt, Arabia, and Persia, on account of its concentrated and nutritious properties; large numbers subsist almost entirely upon it. It is generally the sole food of the Arabs and their camels on their long and tedious journeys over the desert, the voyagers feeding upon the fruit and the animals upon the stones. The inhabitants of these countries also boast of the medicinal qualities of the date-fruit, and of the numerous uses to which the different productions of this tree may be applied. From the leaves they make couches, baskets, bags, mats and brushes; from the branches

or stalks, cages for their poultry and fences for their gardens; from the fibres of the trunk, thread, ropes and rigging; from the sap, a spirituous liquor, and the body of the tree furnishes fuel.

The Date-palm is propagated from the seeds and suckers, but more successfully from the former. The cultivation of this fruit should be greatly extended, as it may become an important and profitable resource of the inhabitants of southern Florida. The bunches or clusters of this fruit often attain a weight of 15 pounds.

GRAPES, (*Vitis.*)—The finer European varieties of this fruit, such as are cultivated under glass at the north, are all hardy and are grown more or less successfully in the open air in Florida, ripening at St. Augustine about the first of July. But the same diseases which have affected this valuable fruit in other countries, and in our own, have been more or less prevalent here. The northern or native varieties have not been sufficiently tested to form a correct estimate of their value, as compared with their European rivals, for cultivation in this climate.

Several vineyards, consisting of northern vines, were established on the St. John's river just previous to the breaking out of the rebellion, during which they were abandoned, and their cultivation has not since been properly or actively resumed. It is believed, however, by some who profess to know, that many of the northern varieties will succeed well in this climate, and that their introduction will prove an advantage.

East Florida is generally flat, however, and the mean level of water in the ground only two to eight feet from the surface, according to the season, wet or dry; and as the vine imperatively demands a uniformly dry, calcareous or rocky soil, and to insure the best condition for its successful propagation should never stand in water, it would seem that Florida is not the natural home of the grape, and that intelligent or experienced vine-growers would not select it for the purpose of establishing vineyards, with the expectation of complete success.

THE PEACH, (*Amygdalus Persica.*)—This tree is long-lived, healthy, and vigorous throughout Florida, and is never subject to injuries from the peach worm or the diseases which so universally afflict the fruit in the northern States. The most delicious peaches may be raised almost without care by every family, and in abundance sufficient even for the economical feeding of swine. The early varieties of this fruit ripen in the beginning of June, and the latest sorts continue until late in August. The earliest and the latest varieties should be chosen for cultivation in Florida, as the rainy season commences in July and continues throughout that month, causing much of the maturing fruit to crack.

THE NECTARINE, (*Amygdalus Persica.*) the APRICOT, (*Prunus Armeniaca,*) and the ALMOND, (*Amygdalus communis,*) are all at home in Florida, and not less vigorous, healthy, or productive than the peach; and all who will take the trouble to plant and care for the trees may be assured of an abundant reward.

THE PLUM, (*Prunus domestica,*) and Prune, (*Prunus domestica,*) are also healthy and productive, being entirely exempt from the ravages of the curculio so prevalent at the north. All the varieties of the wild plum are indigenous and abundant in nearly every part of the State. Many of the varieties are of excellent quality, and, when cooked, form a delicious preserve for family use or for canning.

PEARS, (*Pyrus communis,*) and QUINCES, (*Cydonia vulgaris,*) are worthy of more attention than they have heretofore received. It is believed that some varieties of the former will do well, but as yet their cultivation has not been sufficiently tested to fix their status among the fruits of Florida.

APPLES, (*Pyrus malus.*)—The cultivation of this fruit here is of doubtful utility, though it is believed that some of the earlier varieties may be advantageously introduced. The writer has a dozen young trees in his garden, planted two years since, which are growing thriftily and give excellent promise.

THE OLIVE, (*Olea Europæa,*) succeeds well in the more northerly part of Florida, and this year fine crops have been gathered at St. Augustine; but it is

believed that the latitude of Fernandina is more favorable to their successful cultivation than the former point.

THE MADEIRA NUT, or European walnut, (*Juglans regia,*) and the Pecan nut, (*Carya oliviformis,*) succeed well and produce abundantly as far south as St. Augustine and at Key West; the Cocoa-nut, (*Cocos nucifera,*) and Brazil nut, (*Bertholletia excelsa,*) attain their highest degree of perfection.

MELON, (*Cucumis.*)—Floridians think, and often remark, that this fruit is nowhere else produced in such high perfection as in Florida. The watermelon (*Cucumis citrullus*) matures as early as May at St. Augustine, and might be made a profitable source of supply to northern markets from this place.

CULTURE OF THE ORANGE AND CITRON.

BY LAURA C. REDDEN, SORRENTO, ITALY.

It has been remarked by scientific observers who have given attention to the subject, that very nearly all, if not all, the different climates which predominate in the various countries forming the continent of Europe, with their different gradations of heat and cold, may be found within the limits of the territory comprised by the United States.

Experience has shown that those latitudes in which the temperature is most free from the extremes of heat and cold are the most favorable to the perfect growth, health, and development both of the animal and the vegetable kingdom. The climate of some portions of southern Italy is especially noted as possessing this much-prized peculiarity; and in such places vegetable life reaches a high degree of perfection, and has that peculiar glossy, dark-green foliage which is never met with in the arid atmosphere of more torrid latitudes. The orange and citron particularly display great profusion of growth. Among the many vast and undeveloped resources of the United States—which may be regarded as still in their minority when the question of utilizing their wonderful natural advantages is considered—is their capacity as a fruit-growing region, especially the adaptation of the southern portion of them for the production of the more valued fruits peculiar to warm climates; and still more particularly, for the cultivation of orange and of citron plantations, there remains a wide and unopened field for agricultural enterprise and speculation.

The languishing condition of certain agricultural interests in the southern States—which will in all likelihood be years in recovering from the injuries received, and in adapting themselves successfully to the changed state of affairs—makes it necessary that new and unexplored veins in the undisturbed mines of our natural riches should be struck into and followed up to atone for the deficit made by the temporary stagnation of southern trade. I maintain that a great deal might be obtained from the orange and citron plantations of the south to go to the filling up of this vacuum, if the cultivation of these fruits were only followed up as a specialty, in the best manner, and in an emulative spirit.

That this is not the case now, and never has been, is but too clearly proved by the fact that at the present time, with such wide stretches of land covered by orange groves in our southern States, we still continue to do a large business in importing oranges and citrons from foreign countries.

The little plain of Sorrento, which is the orange garden of the Neapolitan provinces, exports annually large quantities of fruit to America. I propose to

speak particularly of the method of cultivating these fruits employed in Sorrent as it came under my personal observation.

To those skilled in this special branch of agriculture, my observations may be of but little value; but to those who may think of buying up some of the deserted and ravaged lands now lying idle in the south for the purpose of speculation in orange plantations, a few practical observations on climate and mode of culture may be very useful as a guide.

A people who have for generations lived and died planting, and rearing, and harvesting oranges and citrons, should from their experience have something to tell us worth learning, especially when we, in comparison with them, are just beginning.

The more common and vigorous species, both of the orange and citron, attain to so high a degree of excellence in the plain of Sorrento, that a simplified description of its climate and situation will be found useful. A French scientific writer has called this region not inaptly the Normandy of southern Italy, because Normandy is the province of France in which the climate is most bracing and temperate, and the people most robust and vigorous.

The plain of Sorrento, entirely and thickly covered with the foliage of dense orange groves, leaving but scanty space for the very narrow streets of its villages, is encircled and shielded on three sides by high hills, and open only to the sea on the north; and the winds which have the freest access to it are from the north and northwest. From the south, the southeast, southwest, and northeast winds it is in great measure exempt, and they never reach it until their violence is, in some measure, broken.

This fact, the stillness of its atmosphere, and its situation—it being a basin or valley with a high rim, formed by the crescent-shaped hills, and stretching down to the sea, to which, however, it does not slope, as a high line of cliffs rise abruptly from the beach, and the plantations run down to the edge of these precipices—predispose its climate to humidity; and it would, indeed, be very damp but for these north and northwest winds of which I have spoken, which blow with sufficient frequency to keep it cool, and maintain the soil in that desirable state between complete humidity and too great dryness, which is the great ultimatum in the successful culture of acid fruits. Orange and citron trees need a soil inclining to humidity, a temperature not too high, (for that would be drying)but rather cool, and as even as possible, and protection from violent winds. Irregularity of temperature, sudden changes from heat to cold and the reverse, are the greatest enemies to their successful culture.

Rain falls in Sorrento with much greater frequency than is generally supposed; and, during the dry spell, want of rain is compensated by constant vapors rising from the sea. I state this to counteract the erroneous impression that a very tropical climate is necessary for the cultivation of acid fruits. If by "very tropical" is meant a burning and parching heat, the description will not apply to this part of southern Italy along the seaboard. The sea is constantly sending, on the wings of the wind, mist and vapor to refresh the land. The sun drinks up these daily supplies of moisture; but they are renewed nightly. Then, too, the greatest quantity of rain in the region about Sorrento falls during the last hours of the night and the first of the morning. A great quantity falls, but the country, by its soil and situation, has every facility for drainage, and most of it runs off or sinks in at once, and the sun of early morning soon dries up the remainder. So that from one day to another you would think it did not rain, if you were not a careful observer, and you would wonder how the country could be kept so green and fresh, quite damp in shady places, and so free from dust. I state these facts because some researches into peculiarities of climate are necessary to arrive at a knowledge of what situations and what conditions of atmosphere are most favorable to this species of agriculture.

The time chosen for commencing the culture of the orange and citron should be during rainy or damp weather, free from dry and frosty winds. Nothing is more unfavorable to them than cold, strong winds, or spells of freezing weather or frost. Let the time selected for planting out the young trees be still and damp. They should be shielded against the possibility of being shaken by the winds, or chilled by changes of temperature, put back by too great dryness.

A very light soil is the best in which to plant out the young trees. A clayey soil is prejudicial. When the earth contains too many parts of clay, the peculiar species of soil which is found close around and under old and decayed buildings on their demolition, rich with rotten wood and other vegetable and animal matter, will be found highly beneficial as a mixture. Even in a heavy soil one may succeed well, provided that the soil be very frequently moved, and kept constantly light and soft about the roots to facilitate their spreading and growth.

The next question to be considered is that of manuring the trees. They require a great deal of manure, but it must be administered with care and prudence. The best manure for them is that of horses and cattle, but it is never to be applied in its raw state. For it should be understood that these trees are always so delicate, especially when in their infancy, that a strong manure would injure, and, in many cases, destroy them, as it burns up the delicate fibres of their roots. The proper method of preparing a compost for these trees is to throw the manure into pits prepared for the purpose, where it should be mixed with vegetable matter of different kinds, putrid and decaying leaves and the like, and remain a longer or shorter time in order to diminish its strength. The prudent cultivator will usually have manure in his manure pits. In some it will be in process of preparation, and in others in readiness for application at all times as it may be needed.

The best time for applying this reduced manure is during the rainy season in the fall of the year, that the rains by dissolving it may carry the nutrition which it contains down to the roots of the trees. It is the custom to give a thorough and general manuring to the plantations only once in the year, and, as I have said, in the rainy season of autumn. But the same prudent cultivator before alluded to will always have the proposed compost in readiness in the pits at all seasons of the year, the summer months excepted, to be distributed judiciously about those plants which, being more delicate and less forward than the others, require more care and nursing. After making these statements I shall have no occasion to warn cultivators against the use of guano, and to prohibit its employment in soil where the orange and citron are cultivated, as it is altogether too strong a manure, and would be peculiarly dangerous to young and delicate trees.

There are two methods of propagating the orange and citron. The first of these is technically called by the Italians "teste," that is, "from the head." This consists in planting out the young branches of the orange or citron, care having been taken before severing them from the tree to make them put forth their roots in a kind of vase of earth which is bound around them at the junction where they are to be separated. But this method is now almost abandoned, experience having proved that the trees thus propagated are never strong and long-lived like those produced from the seed of a tree which has not been propagated by a cutting. They do not so well resist changes of temperature, nor do they bear fruit for so many years, nor in so great a quantity as the trees propagated from the seed. The best mode of propagating, therefore, is to take the young plant produced from the seed of a wild orange or citron tree. These little plants, of course, are always springing up over plantations, and must have their share of attention.

It should be remembered, however, that an orange tree is always wild, and produces in its natural state only sour fruit, until a scion of a cultivated tree, one bearing sweet fruit, which happens to a tree originally wild only after years of

cultivation, has been grafted upon it. The young plants produced from the seed of the wild or uncultivated tree, after nine or ten years have elapsed from the time of the seeds first pushing up shoots, must be grafted in order to produce sweet fruit. This consists in uniting a young and tender branch of a cultivated tree, bearing sweet fruit, with the young wild tree in such a manner that the sap of the two will commingle and the wood grow together; the scion receiving the sap of the wild tree will bear sweet fruit. The grafting must be done as expeditiously as possible, as it is necessary that the branch to be grafted upon the wild tree should be united with it while freshly cut, and before losing any of its vigor.

The process of grafting orange trees is a science by itself, of which it is necessary to have a practical knowledge. In Sorrento even old and experienced cultivators do not attempt it themselves, but always have recourse to a class of men whose avocation it is to go from plantation to plantation to perform the process of grafting upon the trees; and to do it successfully one must first learn it practically from an experienced grafter.

I should have stated before that the young plants during the first nine or ten years of their life should be kept well weeded, the earth around them soft, light and damp, and lightly manured. At the end of the fourth year they are separated by thinning out where they have naturally sprung up closely together, and transplanting the young trees about two feet apart, into earth which has been dug up and broken to the depth of two feet, and the same treatment as before is continued for them. After seven or eight years, counting always from the time of the coming up of the seed, a selection is made of the finest and most robust plants, and they are transplanted to a separate site at the distance of about three feet three inches one from another, and the same cultivation is continued for two or three years, according to the backwardness or forwardness manifested, and then they are grafted according to the method which I have before described. After they are grafted they remain two years longer undisturbed before being transplanted to the site where they are to remain permanently.

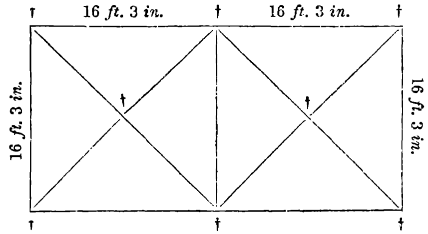
Three years after this final transplantation they produce, ordinarily, their first fruit; thus it will be seen that young nursery plants produced from the seed should be grafted five years before the time at which they produce fruit. Calculating from these facts, a young tree produces fruit in 14 or 15 years from the time that the seed sprouts up. A promising young tree carefully cultivated will produce during its first year from 20 to 25 oranges.

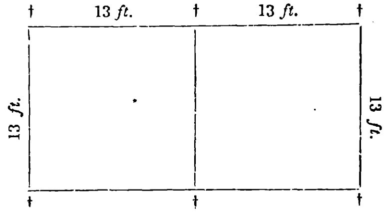
It must be borne in mind that, in all the various operations just described, the earth must always be well spaded and hoed previous to transplantation, and must be kept so to facilitate the spreading of the young and tender roots. The quality of the soil and the care which is bestowed upon the young plant will retard or abridge more or less the period at which the tree bears its first fruit. Of course this method of propagating from the seed, can be rendered less tedious by transplanting young wild trees, which will be found ready to the hand in the various stages of growth, and grafting the sweet fruit-bearing tree upon them.

When a considerable number of young trees are to be planted permanently, or a plantation to be laid out, there are several methods of planting. But no matter what the distances may be which are fixed upon to be left between the plants, they should be adhered to with mathematical regularity. One method is to plant two orange trees and two citron trees at regular distances, forming a square, and in the centre of this square to place an olive tree or a nut tree, or any other fruit-bearing tree whose presence will not interfere with the culture of the acid fruits.

The Italians call this planting *colquartro*. In this case 16 feet and 3 inches are left between the trees. But if it is not desired to plant a tree in the centre of

the square, about 13 feet distance from tree to tree will be sufficient. The following diagrams may give a slight idea of these two methods:





The best method is to leave the centre vacant so as not to crowd the trees when full grown; but if preferred for the purpose of economizing space it is best to plant a fifth tree in the centre of the square; in preference let it be an orange tree or citron tree, as it is not best to mix other trees with those bearing acid fruits.

When the young tree has borne fruit for six years it is considered full grown. The Sorrentines have a sort of basket which is used as a measure for the fruit. This is called the colletta, which will hold about 100 oranges or citrons. This is used in gathering the fruit. When the fruit of one tree fills the basket that tree is considered full grown. From that time the yield continually increases until the tree gives 10 baskets full; that is to say, 1,000 oranges when it is considered at the height of its fruit-bearing capacity. This usually occurs about the twenty-fifth year of its age, counting always from the seed.

The trees, however, do not bear uniformly the same quantity of fruit every year. For this reason the harvest is considered complete only every two years; and note should be taken of those years when the tree is resting, especially the year after a very full harvest, when the tree will yield but little fruit comparatively. An orange tree in its natural or wild state, before being subjected to cultivation and grafting, is called in Italian "cedrangolo." I will make use of the word hereafter in speaking of such trees, as we have no single word in the English language which will so conveniently designate the species meant.

An orange tree which is the product of the seed of the cedrangolo, and which has been grafted, is very long-lived, and has the advantage in this respect over every other species, being stronger, more vigorous and better able to resist all accidents of temperature. One may calculate on 60 or 70 years as the limit of its fruit-bearing capacity, in proportion to the vigor and natural superiority of the plant, always bearing in mind the possibility of some unusual cold or freezing spell which may impair the vitality of the tree. These possibilities excepted, the preceding figures give the correct limit of the period during which the tree bears fruit.

An orange tree, therefore, under the best method of cultivation and favorable circumstances, will flourish for 75 or 85 years from the time of the planting of the seed; after that it may be considered as a cumberer of the ground. But its usefulness even then is not at an end. The wood of the orange tree is much prized by the workers in inlaid woods in Sorrento for its beauty, durability, and peculiar fragrance, and always brings a fair price. The most beautiful articles are made from it. Its hardness renders it susceptible of high polish and elaborate carving.

The tree which is produced by the operation called "teste," before referred to, is much shorter-lived, being much less hardy. After 30 years it begins to grow old, and is considered as having passed its prime, while on the contrary the tree produced from the seed of the cedrangolo resists more successfully all the variations of temperature, and even great negligence in its culture.

Orange and citron plantations must be thoroughly dug over twice a year. The

best times for this operation are just before the commencement of the rainy seasons in the spring and the fall. A kind of circular ditch, or pit, is left at the foot of the tree, in which the manure is deposited, and which serves for receiving the rain and facilitating its passage to the roots of the tree, while at the same time it carries along with it the nutriment contained in the layer of manure through which it percolates to reach the roots. These holes around the trees are called, in the Sorrentine idiom, "scalzatine," and it is both useful and important to make them about the trees frequently at other seasons of the year, especially when, after a long drought, rain is expected. In regard to pruning, it should be known that trees bearing acid fruits, especially the orange and citron, cannot be pruned like other fruit-bearing trees. Those branches alone which are sterile and give no promise of fruit, after a fair trial, should be lopped off. This is done to concentrate and increase the vigor of the tree, but requires much prudence and discrimination.

The orange tree bears fruit only once a year. It flowers in the month of May. Six months are required to ripen the fruit, at the very least; but to mature it thoroughly before gathering, the fruit hangs on the boughs until December. In climates where the temperature of late autumn and early winter might be severe enough to injure the fruit, it can be gathered in September, as it will ripen after gathering. This is the rule in Sorrento, where a considerable trade is carried on in exporting oranges and citrons, in sailing-vessels to America.

The fruit is gathered in September while yet green, and being wrapped separately in very light paper, is carefully packed in wooden cases and shipped upon a voyage which lasts several weeks; and on reaching their destinations they are found fresh, sweet, and quite ripe. This does them no harm, but, in fact, improves their flavor; as an orange plucked before quite ripe and kept for some time is superior to one just from the tree. The latter has a crude and acid taste, which is lost by keeping. The distinguishing quality of the oranges of Sorrento is that, from the peculiarity of the soil, they contain more spirit and flavor and a stronger essence than those of Spain, Sicily, Calabria, or even of the neighboring province of Salerno; this peculiar quality renders them more suitable for packing for long voyages. A fruit which is perfect in taste, when taken from the bough, is almost sure to have lost its flavor, and to have become insipid after having been kept for a time. But the oranges of Sorrento are the reverse of this.

Only one species of orange is recognized as being cultivated in Sorrento. There is the blood orange, as it is called, which, on being cut open, is found perfectly sanguine in hue; but this is not considered as a different species, and is identical in taste with the ordinary orange of Sorrento, which attains a great size, and grows thriftily. The skin is very thick on being first gathered, but becomes thinner with keeping.

The Mandarin, that little beauty, with its delicate and fragrant rind and delicious flavor, does not succeed well in Italy, nor anywhere outside of Sicily, and is only cultivated as a fancy fruit in Sorrento, by some growers who can afford the time and care necessary; as the tree which produces it is most delicate and sensitive, and a peculiar soil is needed to bring the fruit to perfection.

In the island of Ischia, the Mandarin has been found to succeed better than anywhere else in the Italian provinces. In other places its flavor is degenerated. The difference in the fineness of texture of the rind, and in the size and flavor, is so great as to render it difficult to believe that they belong to the same species.

Neither the climate nor the soil of Sorrento is favorable to the Mandarin, which requires a particular sort of culture; and, wherever a plantation of Mandarins is found there, it is necessary to cover the trees with mats in the winter time and otherwise protect them from the cold. They also require a very light

manure, different from that used for the common trees, which must be frequently and carefully employed.

There is one interesting operation in connection with the cultivation of the orange tree, which I have now a good opportunity of mentioning. This is the grafting of the citron upon the orange, or rather the combination of the two fruits upon one tree. This is not profitable in a practical point of view, and is solely a matter of fancy for the sake of the novelty of having the two kinds of fruit upon one tree. I was sorely perplexed when I first saw oranges and citrons both growing thickly upon one tree. It is identical with the operation called "teste," before mentioned: a young branch of the citron tree is coupled with the young branch of an orange tree, both freshly cut and united in such a manner that the sap of the two will commingle. All that has been said in regard to the cultivation of the orange tree applies strictly to the cultivation of the citron.

There is this difference between the two fruits—the tree which produces the orange is more delicate than that which produces the citron. But the fruit of the citron tree is more delicate than that of the orange tree. Take for illustration an orange tree and a citron tree, laden with fruit during the winter time. At the very slightest frost the fruit of the citron will suffer, and lose its juice, but the *tree* which bears it will more successfully resist the cold, while, on the contrary, the cold will not much injure the orange fruit, but will prove dangerous to the tree.

To understand why the fruit of the citron is found hanging on the boughs at the commencement of cold weather, thus running so many risks, it is necessary to know that the citron bears fruit twice in the year; and for this reason its cultivation is often preferred to that of the orange. It flowers with the orange tree, in May, and again, but not so plentifully, in the autumn. The fruit can be plucked and used at any time after it has attained a reasonable size, although it may be still green. As a convenience it is gathered at the same time with the orange yield in September, for exportation. Another but lighter crop is gathered in the early winter.

There are three varieties of the citron cultivated in Sorrento. One of these is called in Italian "Lustrato," and is preferred to the others; then, there is the ordinary or common variety; and a third, which is very small and always green, and of a very peculiar and pungent flavor, quite different from the others. The culture of this last variety is on the decrease in Italy, and in a short time will most certainly be altogether abandoned. The Lustrato is of a larger size than the ordinary citron. Indeed, it is frequently enormous, and, on this account, as well as for its handsome rind, and its property of preserving its flavor for a great length of time, it is preferred for exportation to America and other distant countries. It is from trees that produce the Lustrato that are obtained those enormous citrons, as large as a small melon, which are gathered in Italy at Easter, and as presents seem to have about the same significance as Easter-eggs, a custom anciently in use among us. Comparatively few of these are produced. They are obtained by gathering, while yet green, all the citrons from a tree, with the exception of a few which are left to hang; and which, by absorbing all the fruit-producing nutriment of the tree, obtain an enormous growth, and are so heavy that they must be propped up to prevent them from breaking the boughs to which they are attached.

The ordinary citron is cultivated for consumption in Naples, and for exportation to France and other adjacent countries. For this purpose it is gathered and shipped during the summer time, and during the hot weather the demand for it is so great that from $12 to $15 per thousand are often given. It is not so suitable for long voyages as the Lustrato.

The different varieties are produced by grafting and the operation called "teste." But the trees will not again bear fruit for two years after the operation is per-

formed. The grafting can also be performed on the young trees, which are still tender, and any variety of citron may be thus produced. This last method is to be preferred as being more expeditious. Great quantities of fruit are shipped yearly to America from Sorrento by established houses which make this exportation a specialty; but so far, it has been impossible to obtain any definite report as to the precise value of these exports.

Orange-flower water is not manufactured here, the plantations not being extensive enough to make this species of industry profitable. It is, therefore, monopolized by Calabria and Sicily. But of late years a considerable manufacture of the essence, which is extracted from the leaves of the "cedrangolo," has been commenced, and the trade carried on in Sorrento. This is a medical preparation, and has all the soothing qualities of an opiate without any of its subsequent effects, and is most agreeable to smell and taste.

From the rind of the cedrangolo is also made a kind of marmelade or confiture, which is largely in demand and sells at a very high price, being in great repute as a stomachic and a promoter of prompt digestion.

Bees should always be kept where there are orange plantations. If maintained on a large scale great profits may be obtained, as the very best honey is made from the flowers of the citron and the orange, which are the same in shape, size, color, and odor. All the honey made in Sorrento smells and tastes of the ravishing perfume of the orange-flowers, and it has become classical as the best that is produced, analogous to the honey of Hymettus.

And now to make a summary of what has been said, we have seen that there is no part of the orange tree or the citron tree which does not yield its share of profits. The fruit, the flower, the leaf, and finally the wood of the worn-out tree itself are all items of profit to the planter; and, in connection with their culture, can be carried on another industry equally as profitable, which requires but a small outlay, and is dependent only on the maintenance of the bees and the blooming of the orange-flowers. The outlay, the time, and the labor involved in the cultivation of acid fruits are very much less, comparatively, than that involved by other branches of agriculture peculiar to mild climates. It is not to the point to say that we have already in the southern States vast groves of these fruits which grow and ripen with little or no culture. The point is to bring the culture of them to perfection, to make it a specialty, and thus, in some measure make up for the temporary loss of some important staples for which a peculiar kind of labor seems to be required, and laborers also of peculiar qualifications; while for the culture of orange plantations no skilled hands are required, except for the operation of grafting, and fewer laborers needed.

The improvement and cultivation of our country to the utmost of all its great agricultural capabilities will form one of its most powerful bulwarks against national poverty and abject dependence upon foreign nations.

AMERICAN WINE AND WINE-MAKING.

By George Husmann, Hermann, Missouri.

No other branch of agriculture or horticulture has of late attracted so much attention as the subject of grape growing. Almost innumerable varieties have sprung up and been disseminated, each claiming some superior merit over all its predecessors, until the public mind has become bewildered, and those who wish to enter into the delightful occupation of grape growing are at a loss what to plant.

Difficult as the task may be to choose from among the many, yet the choice will become comparatively easy if a few points are duly considered; and I will try to elucidate them in a few remarks, afterwards giving my views about American wines, and how they should be made, summing up with a description of some of the most prominent varieties and their value for wine.

Let me here remark that it is with a great deal of hesitation I undertake the task of writing, at this early phase of our development of this great branch of industry, what must be at best but local experience. I do not claim infallibility, and am fully aware that many of my remarks will be severely, and perhaps justly, criticized; but I may claim that I have given the subject close attention for the last sixteen years, have labored hard and earnestly, experimented a great deal, and it is *experience*, the *results* of these experiments, which I give here, not mere surmises formed under the hasty impressions of casual observations.

The starting points from which we should look for all the results to be attained, may be summed up as follows:

1. Grape-growing, especially with a view to wine-making, is a purely local question, and only such varieties should be chosen for a certain locality as will attain their greatest perfection there, and are as free from disease in the locality as can reasonably be expected.

2. A grape, to make the best wine the variety is capable of making, must be perfectly ripe, not merely colored, for only when fully ripe does it attain that delicacy of flavor, which will always distinguish the product of a good locality from that of an inferior one.

3. The time will come, in this country as it has long since in Europe, when the difference in quality of native wines will be fully appreciated, and when those who produce the best will get four times the price for it which others will realize for an inferior article.

4. No careless man need attempt the business, for he will surely fail. To make a really good wine and to take care of it properly after it is made requires great industry, extreme cleanliness, careful and incessant watching, and a critical taste, which will enable the operator to judge of the quality of the material he has to work upon, and the exact time when it should be racked, handled, and bottled. Now let us look at these several points a little closer. First, in regard to locality for each grape. A recent visit to the east, on which I tasted many samples of wine made there, has forced the conclusion upon me that it is entirely useless for them to try to make a first class Catawba, such as we can make here. And why is this so? The reasons are apparent. The Catawba, although it may color in Pleasant Valley, Crooked Lake, or Northeast, does not get perfectly ripe.

Its acid centre does not dissolve, it does not develop the delicacy of aroma which the perfectly ripe Catawba possesses, and consequently the wines are acid, harsh, and have but little flavor. The same holds good in regard to the Concord. The latter colors with us the beginning of August, and yet we do not attempt to make wines from it until the latter part of September. The Catawba colors here about the middle of August, but those who intend to make a really good wine do not gather their Catawba grapes until the 10th of October. The longer a grape hangs on the vine the more its watery substance evaporates, the acid diminishes, and the sugar increases. Therefore it is that all Catawba wine made at the east has an unripe taste and but little flavor. They should, for wine, confine themselves to such early ripening varieties as the Delaware, Creveling, and Rogers No. 3. Of these I am sure they could make good wine instead of the miserable apology for Catawba, Isabella, and Clinton, with which they now flood the market, and which requires a large fund of local patriotism to assist in its consumption.

Not even the Clinton, although it colors early, will make a good wine unless allowed to hang late, as it requires a longer season to ripen than they have in the

section named. It is a well-known and established fact in Europe that the temperate zones will produce the highest flavored wines. Neither the north nor the south will furnish them; although the latter will produce wines of good body, (for instance, Sherry, Port, the different Italian wines, &c.,) they lack that delicate fragrance, that exquisite bouquet, which has made the fine German and French wines the universal favorites of the civilized world.

And in this country the same rule seems to apply; for among a great many California wines tasted I have not found one which was of really fine flavor; although in one or two instances they were of very fair quality. The hot and arid climates of California and Mexico do not seem to develop the bouquet requisite in a first-class wine; and although they may make a great quantity, in quality they will not be able to compete with the west. "Westward the star of empire takes its way," and Missouri, Illinois, Arkansas, and perhaps parts of Indiana and Ohio, will produce the wines which alone are destined to be the pride and boast of this nation.

Already have our Norton's Virginia, Cynthiana and Herbemont become famous; and in a few years we may boldly throw down the glove to Johannisberg, Steinberg, Chambertin, and Chateau Queen, and challenge them to produce better wines than our cellars will furnish.

Therefore the grape-grower should only select such varieties, with a view to wine-making, as will fully ripen in his locality; but they should also be perfectly healthy, free from disease in any form. Not only does the fruit from a healthy vine make a better wine, but it also makes a great deal more; and only when the wine-maker can count upon a sure return every year will his vineyard and cellar warrant all the outlay of capital, labor, skill, and nerve which are required to make him successful. A grape may be ever so good, make an excellent wine, and yet it will never become popular, nor be extensively planted unless it is also healthy. Only from healthy varieties, those which yield a certain return every year, can we make wine so cheap that it will become the beverage of the masses. If we can count upon 1,000 gallons to the acre per year, we can afford to sell that wine much better at 50 to 75 cents per gallon than we can sell wine of a variety which yields but 250 gallons at $1 50. The labor is nearly the same and the capital it yields is larger.

We want wines, good wines, for the laboring classes at low figures, and of these we should grow the greatest bulk.

We also want choice wines for the fastidious in taste, those who are able and willing to pay a high price for a luxury; but the choicest wines will always be restricted to certain and limited localities. Both objects can easily be attained; but every one who strives after the utmost perfection will have to experiment a great deal, and he need not think that his experiments will all be successful. Only by long practice can he acquire the critical taste and nice judgment requisite to make the best of the material he has to work with.

Wine-making is an art, and is not acquired in a single season. Grapes have different qualities, and require different treatment to convert them into the best wine they are capable of making. After these few preliminary remarks we will look at the operation itself.

GATHERING THE GRAPES.

As already remarked, the grapes should be thoroughly ripe. The best indications of ripeness are: the stem becomes brown and woody, and begins to shrivel; the berry begins to shrivel around the stem, the skin becomes thin and transparent, and the juice becomes very sweet, sticking to the fingers like honey or molasses after handling the grapes for some time. If any bunches are backward in ripening, as is often the case, the ripest are gathered first and those that are not fully ripe remain on the vines. They will ripen much quicker after the ripest have been gathered.

The stems should be cut as close to the bunch as possible, as they contain a great deal of astringency, which is apt to make the wine rough. All unripe, rotten, and deficient berries are carefully picked out, and none remain on the bunch but those which are perfectly ripe. Generally the gatherer carries two pails, and the unripe berries are thrown into one for a wine of inferior quality. Space will not permit me to describe all the implements used in wine-making. Those wishing further information about them are referred to my book, "Grapes and Wine," where they will find them described. I will simply name them here: Pails for gathering the grapes; wooden vats for carrying them out of the vineyard, either to the wagon, or to the press direct; the grape-mill, with either wooden or stone rollers to mash the berries; fermenting tubs or vats to receive them after mashing; the press casks of various sizes; and a good cellar, divided into two compartments—the fermenting cellar, which should not be too cool, to facilitate fermentation; and the cellar for ripening and keeping the wine, which should have an even temperature of about 45° in summer and winter.

The temperature of the fermenting cellar may be, at the time of wine-making, about 60°. To make white or light-colored wines, of delicate flavor and smoothness, the grapes should be mashed and pressed as soon as gathered. The Catawba, Herbemont, and Rogers's Hybrid No. 1, especially require this treatment.

The skin of the Catawba contains a great deal of tannin, as do the stems, and the most delicate Catawba and Herbemont wine is made by pressing the grapes without mashing, and keeping the run separate from the after first pressing. In this way a white wine can be made of the Concord, but whether this is an improvement is still a mooted question. I think not; the wine made by this method of the Concord is to my taste insipid, and the Concord is evidently a grape for red wine, a wine somewhat resembling claret, with less astringency, and lacks character if treated in the above manner, although it should not be allowed to ferment in the husks longer than 24 hours, as its flavor will become too fiery and the wine too harsh.

It is here where the question may most properly be asked: Shall the must be left as nature gave it, or shall sugar and water be added? This question has of late called forth a good deal of discussion; one party claiming that nature makes the wine, and the juice of the grape should be left just as nature gives it, without any manipulation or addition whatever. The other, that nature furnishes the *raw material*, but that wine is an artificial product, which requires all the skill (guided by reason) of which the maker is capable.

The latter is evidently the most reasonable view. My ideas about this question may be given in a very few words. If nature furnishes me in the grapes which I intend to make into wine, a juice which contains everything to make first-class wine, in the right proportions, I shall leave it so on the principle, "let well enough alone;" but if I think there are deficiencies which can be supplied by adding to that which is already in the must, but not in sufficient quantity, I shall do so, as my reason was given me by an All-wise Creator for the purpose of using it to the best advantage. All grape juice contains in larger or smaller proportions, sugar, water, free acids, tannin, gummy and numerous substances, coloring matter, and fragrant or flavoring substances. A *good wine* should contain all these ingredients in *due proportions*. The saccharometer will show me the amount of sugar contained in the must; the acidimeter the amount of acid it contains. If I find that the must does not contain sugar enough, and an excess of acid, what can be more natural than to add the sugar, and to dilute the acid by adding water? Both are ingredients of the grape; where, then, can be the harm of adding them, until the proportion is attained? But this is not all. Many of our native grapes contain an excess of aroma as well as an excess of acid. If, by a proper manipulation, this also can be toned down, so as to be pleasant instead of offensive, it is an improvement, not an adulteration, and such a wine is certainly just

as pure and more wholesome than the pure juice of the grape, with its excess of acid, tannin, and aroma, would have been.

In short, in all the manipulations during the process of wine-making, the operator must have an ideal standard in view, the utmost perfection which can be attained from the variety he has to deal with, and must try to bring his must up to that standard.

The process of adding sugar and water to deficient must is called Gallizing, after its most successful and strenuous advocate, Dr. Gall, and extracts from his works have already been given in former volumes of these reports, to which I would refer the reader for much useful information.

But there is a method still of using the husks of the grapes after the first gentle pressing to much greater advantage than can be done by distilling, which is called, after its inventor, Chaptal, Chaptalizing.

It has been the custom in France, after pressing the grapes as dry as they can be pressed, to give the husks to the servants and laborers, who would add water, let it ferment a few days, and thus make an inferior wine which they used as a common drink. Mr. Chaptal investigated the matter closely, experimented, and found that by pressing for the first time only two of the wine-making ingredients were exhausted, namely, sugar and water, and that the husks contained still an abundance of acidity, tannin and flavoring—in short all the ingredients to make wine except sugar and water. This once established, what could be more natural than to add these and make, so to say, another edition? The experiment was tried and succeeded beyond expectation. Mr. Chaptal even contends that it can be repeated several times, and that even the third repetition will make a drinkable wine, one in quality very little behind the first.

If we apply the practice to American wine-making we find the result very gratifying. Our native grapes are nearly all so abundantly supplied with flavor and tannin, that the Chaptalized wine is very little, if any, inferior to the first pressing. Of course there is in this, as in everything connected with wine-making, a wide difference in varieties. But there is a limit to everything, and I would certainly not indorse third, fourth or fifth editions; but if, after pressing and perhaps properly Gallizing, the wine-maker finds that the husks still contain an abundance of wine-making ingredients, and that only sugar and water have been exhausted, I can see no reasonable objection to making another edition, especially when it is kept separate from the first.

I have done so repeatedly; have even made three different classes—pure grape juice, such as was Gallized by adding one-third water and sugar, and another which was only sugar and water fermented on the husks. I have placed the three wines before good judges, told them of the difference in the making, and asked them to pick out the pure juice. In nearly every instance were they unable to do it; but the majority agreed that the Gallized wine was the best, the Chaptalized next best, and the pure juice, although good wine, not as agreeable as either of them. This was Concord, and of course we must modify the treatment according to the variety and the season we have to deal with.

And above all, let us be strictly honest in this matter. Let the purchaser know what he is buying if he desires it, and let the best wine according to his taste bring the best price.

As before remarked, in no case do I add anything foreign to the grape, seeking only to supply nature's deficiencies, and I do not follow it to half the extent it is followed in Europe. Only since Gallizing and Chaptalizing have become so universally adopted has European wine become so uniformly palatable and cheap. Only since this practice was generally introduced do they produce *drinkable* wine in *all* seasons, which formerly they could not do.

Let the reader not misunderstand my position. We can only make the *best* wine in the *best* seasons. We can add the sugar to the product of poor seasons, and dilute the acid by water so as to bring the must to its normal alcoholic

standard; we can thus *always* produce a pleasant and drinkable wine, but the exquisite *flavor* developed in the grape, in the *best* seasons, we cannot make. This is in the hands of Him who alone sends rain and sunshine, and from whom alone come all good and *perfect* gifts. Art can do *much*, but not *everything*.

The better the season the more perfect the grapes, the less will they bear of Gallizing and Chaptalizing, because they do not then contain the abundance of acid which will bear diluting; thus it is that it costs much more to produce the very best wines than a wine of medium or inferior quality. Consequently, in justice to our grape-growers, the practice of paying the same price, or nearly so, for all our wines should cease. An extra quality of Catawba, made from the very pick and prime of the vineyard, with the greatest care and labor, and by leaving the grapes on the vines until the watery parts have evaporated, and of which, consequently, much less has been produced per acre, should be worth treble the price of a wine made from the general run of the vineyard, when the grapes were hardly colored.

It is an injustice to the vintner who produces the *best*, by a combination of skill, labor, and superior location, and by great loss in quantity, to ask of him to sell such a wine for only a slight advance, say 25 cents per gallon, over miserable trash, hardly worthy the name of wine. In Europe this is well understood.

The "Aus-lese" of the German vineyardist is appreciated and paid for accordingly; why should it not be so here?

Let us encourage home industry; let those who are willing to pay $3 to $4 per bottle for good Rhenish wine pay only half that price, or two-thirds, for a native wine as good, and they will soon have wines which will meet all the requirements of the most fastidious taste. But "far-fetched and dear-bought" seems to be the rage, and as long as our own products, even if equally good or better, are left in the cold, and foreign productions bought at extravagant prices, not because they are *better*, but because they are imported, we cannot hope for a thorough reform. We will now look at the most prominent of our American grapes, and their treatment for wine.

WHITE OR LIGHT COLORED WINE, RESEMBLING HOCK.

The Catawba.—This variety, although much subject to disease, is yet the one of which perhaps the greatest quantity is at present made, as nearly all the old vineyards are planted with it.

If well ripened and properly managed it will make a very good wine, but as it contains a good deal of tannin and acidity, it is only in a very few of many seasons that a really first-class wine can be made of it without Gallizing. The must of Catawba grapes should average 80° by Oechsle's scale, to make a good wine without the addition of sugar. The best method is to add to the grapes after they have been mashed about one-third of water and sugar, or to 100 gallons of must add 50 gallons of water and sugar, (two pounds of best crushed sugar to the gallon of water,) test the mixture again, and if its weight is between 80° and 90°, press immediately, without fermenting on the husks. Should the grapes be very ripe add less, and if unripe and acid, add more water and sugar. The mixture should, as before remarked, have about 80° specific gravity by Oechsle's saccharometer, and contain about four per mill acids by Geisle's acidimeter. If very ripe the advocates of pure juice can make a good wine from them without addition, if the berries are not mashed, but put into the press and pressed lightly. But it will not be any better than when properly Gallized, and they will obtain much less in quantity. The husks may afterwards be Chaptalized, according to the individual inclination of the wine-maker, the water and sugar added to weigh about 75° to 80°, and fermented on the husks for from 24 to 48 hours, according to temperature, and more or less violent fermentation. In this, as in everything, practice is required, which alone makes perfect.

The Herbemont.—This makes a very delicate white wine, if the grapes are pressed without being mashed, and the pure juice, if treated in this way, perhaps more nearly resembles a delicate Rhenish wine than any other we may have. The grapes may then be ground, water and sugar added, say as much as there has been pure juice expressed, and fermented on the husks for 24 to 48 hours. This will make a very fine red wine, strongly resembling Madeira, and tastes differ as to which is best, the white or the red. Specific gravity of must about 90°, which proportion should be preserved throughout. In preparing the water, either for Gallizing or Chaptalizing, it may be well to add here that a pound of crushed sugar, dissolved in water, will weigh about 40°, by Oechsle's saccharometer.

Delaware.—The must of this grape is generally so rich, and the proportions so evenly balanced, that it will make a first class wine, of great body and fine flavor, without manipulation or addition. It is, perhaps, the perfection of the Hock or Rhenish wine type among our natives, and will compare with any of the imported wines if well and carefully made. It should be allowed to ferment on the husks, after the berries are mashed, for about 12 hours, then pressed, and as the husks still contain a great deal of wine ingredients, they may be Chaptalized to the same amount as they yielded pure juice. It is always advisable to keep both pressings separate, although I have already made wine by the latter process fully equal to the first. Specific gravity of must from 105° to 120°.

Taylor.—This also makes an excellent wine, which by many is preferred to the Delaware, but it is rather unproductive. It may be treated in the same manner as the Delaware, having the same body, but a different flavor.

Cassady.—This makes an excellent white wine if properly manipulated; but as it has a tough pulp, a thick skin, and considerable acidity, about a gallon of water and sugar should be added to each pailful of grapes, the berries then mashed thoroughly, and the whole mixture allowed to ferment about 48 hours, when it may be pressed and put into casks. Specific gravity of must, 90°.

Rogers's Hybrid No. 1.—This makes an excellent white wine here, where it fully ripens, although at the east it would hardly do so. It has a good deal of flavor, a good deal of pulp and acidity, and therefore needs Gallizing about like the Cassady. If thus managed it makes one of the finest wines we have, of very delicate flavor, smooth and rich. As it is also very productive and healthy, it will become a very popular wine grape here. Specific gravity, 78°.

Rogers's Hybrid No. 9.—This also makes an excellent wine; does not, perhaps, need Gallizing to the same extent, but an addition of one-third will much improve it. It is an excellent substitute for the Catawba, and as it is healthy and hardy, and very productive, it will, doubtless, soon take its place. Specific gravity, 80°.

Maxatawney.—But little wine has been made of this, our best healthy outdoor grape of white or rather amber color. What little I have made leads me to the belief that it will make a very delicate white wine, without Gallizing, and as it seems very productive, and ripens thoroughly here, it will, no doubt, be largely planted for that purpose. Specific gravity, 82°.

WHITE WINE, RESEMBLING HUNGARIAN.

Cunningham.—This grape will, without doubt, attain great popularity as a wine grape here and further south, but it can hardly be planted further north, as it barely ripens here. It makes, perhaps, the choicest wine of this class; the juice may be pressed pure or Gallized. One-third addition of water and sugar will, I think, improve it; and as it has a very spicy, fruity aroma, the husks can safely be Chaptalized. It makes a very heavy, spicy, and fragrant wine, of dark yellow color, which many prefer to the Delaware. Specific gravity, 100° to 112°.

Rulander.—This is not the German grape of that class, but, as I think, a southern variety, closely related to the Herbemont and Cunningham. It makes a pale red, or rather brownish wine, of great body and fine flavor; should be about

one-third Gallized, and will safely bear Chaptalizing. Specific gravity, 100° to 110°.

Martha.—This is, perhaps, our most valuable grape for white wine, as the vine has all the good qualities of its parent, the Concord, and makes a delightful white wine of fine flavor and good body. It seems to succeed everywhere, and would make a fair wine even further north, as it ripens early. Should be Gallized one-half and fermented on the husks for 24 hours. Specific gravity, 92°. The first wine made of it last fall has far surpassed my expectations, and as it is very productive it will soon become one of our leading wine grapes.

RED WINE, RESEMBLING BURGUNDY AND PORT.

Norton's Virginia.—This wine has already acquired a world-wide reputation, and is, no doubt, the best wine for medicinal purposes we now have. The juice should be fermented on the husks for 24 to 48 hours, then pressed, and, when fully matured, this will safely bear comparison with the best port, having the advantage over the latter that it has no addition of alcohol. It is the great remedy here for dysentery and diseases of the bowels, and even cases of cholera have been cured with it. The husks may safely be Chaptalized, and will make a delightful wine. Specific gravity of must, 100° to 120°.

Cynthiana.—This is a dangerous rival to the Norton, and will take the preference with wine-drinkers, though the Norton may be more valuable as a medicinal wine. It is of the same and even greater body, delightful aroma, spicy, and much smoother than the Norton. Altogether the best red wine we yet have, resembling but surpassing the best Burgundy; may be treated like the Norton. Specific gravity, 110° to 125°.

WINES RESEMBLING CLARET.

Clinton.—This grape contains a great amount of acidity, although also a good deal of sugar. The best wine is made from it by Gallizing one-third and fermenting on the husks for 24 hours, when it will make a very good claret, with a peculiar frost-grape flavor, which many admire, though it is not to my taste. The husks can then be Chaptalized, and will, thus treated, make a very good wine. Specific gravity 98° to 105°.

Creveling.—A small sample made of this grape has given me a very high opinion of its quality for wine. It supplies a want long felt among the wine-drinking public of a wine intermediate between the Concord and Norton, and of more delicate flavor. It resembles the choice clarets of France, with perhaps not so much astringency. I do not think this needs any manipulation to produce a good wine. Specific gravity 88°.

Ives's Seedling.—I cannot speak from experience in regard to this variety, as I have never made wine from it; and although I have tasted a good many samples made in Ohio, I have been unable to accord it the high rank our Ohio friends claim for it. It has a pleasant flavor, but a great deal of acidity and harshness, an *unripe* taste, if I may so express myself, which is not at all pleasant to me. Perhaps by Gallizing judiciously a better wine may be made from it than I have yet seen. So far I can see nothing in it which should induce me to prefer it to good Concord, and it certainly does not produce as much per acre, from all I can learn.

MISCELLANEOUS.

These comprise all varieties which cannot fairly be classed with any of the four types referred to, but have an independent native-American character of their own.

The Concord.—This has been compared to claret, but I can find nothing either

in flavor or general character to justify the comparison. It more nearly resembles some of the red Hungarian wines. As its wine has become a universal favorite, as well as the vine, it deserves a little more than a passing notice at my hands. A white wine may be made from it by pressing the grapes without mashing them, but as it is to my taste somewhat insipid I cannot see that there is anything gained by this process. The best wine is made from it by adding one-third water and sugar to the juice and fermenting it on the husks for 12 to 24 hours. It will thus make a light red wine of agreeable strawberry flavor, and which will much improve by age. The wine thus made is effectually the laboring man's drink, can be produced cheap enough, is very palatable, and has a peculiar, invigorating effect upon the system. Let us hope that it will soon become the general drink of the laboring classes, in the place of whiskey and beer. It would be the greatest temperance reform ever introduced in this country. The husks may then be Chaptalized, and the wine thus made will be nearly equal to the first.

Hartford Prolific.—This, if well made, resembles the Concord closely, and though hardly a true *wine* grape, can still be made into wine advantageously where the fruit cannot be marketed very well. It may be treated like the Concord, and will then make a fair red wine, somewhat *fray*, but still not disagreeably so.

North Carolina Seedling.—This is another very decided native, which may perhaps properly be called Muscatel. It has a tough, acid pulp, and strong flavor, but will, if Gallized one-half, make a wine which has met with universal favor and brings a high price in market. It is very healthy, a strong grower, and immensely productive. Specific gravity 84°.

The New Seedling of Mr. Longendoerfer.—This has not even a name yet, as its originator has determined not to send it out until fully proved. I have watched it closely, and with a great deal of interest, for the last three years, as I think it will add something to the list of our wines which we have long wanted —an American Madeira. It is a seedling of the Norton, of the same habit, and with the hardest wood I have yet met with in any native; very productive, and entirely healthy. It is a small black grape, yet does not produce a dark red wine like the Norton, but a wine of brownish yellow color, of great body, and very fine, strong flavor, resembling Madeira very closely. I think it will be a great acquisition for our latitude and further south. This season a larger quantity of wine will be made from it by its originator, and I confidently hope that an American Madeira will be added to our list of native wines. Specific gravity 109°.

Among the grapes which I think will prove valuable for wine, but which I have not yet tested, I will here name Rogers's Hybrids Nos. 3, 4, 12, 19, Alvey, Devereux, Louisiana, Arkansas, and Telegraph. As a general rule in Gallizing and Chaptalizing I aim at making the mixture of the same specific gravity the must would have in *good* seasons. I strive to remedy defects of nature, but not to add to the *natural* body of the must, as all our native wines with which I have had to deal have body enough; even the Concord and Hartford contain sugar enough here in ordinary seasons to make a wine of sufficient body. I seek to correct where a grape contains too much acidity, tannin or flavor, and do this with elements *natural* to the grape, sugar and water. An addition of anything foreign would justly be called an *adulteration*, and should be condemned as such; but Gallizing, instead of being an adulteration, as those have termed it who evidently know little about wine-making and its principles, is an improvement, and a very great one.

There are two very simple tests by which wine can be judged: First, it should be agreeable to the palate, pleasant in flavor, and be perfectly clear and fine. Secondly, it should agree with the system, act as a gentle stimulant, invigorating and joy-inspiring, exhilirating in its effects, and leave the head clear, without any bad effects afterwards. If it fulfils these two conditions I call it good; if it does not, if it has the contrary effect upon the system, I call it poor, adulterated stuff, no matter how pleasant it tastes and how it was made.

It will not be expected in an article of this kind that I should go into all the details of wine-making; these can be found in any good work on the subject, either German, French, or American. The apparatus should be *clean*—mill, press, fermenting vats and casks. The wine, when made, should be closely watched during fermentation, and the casks closed with an air-tight bung as soon as fermentation is over. Our wines are generally clear and should be racked by the end of December or beginning of January, and the second time about the beginning of March. For all after operations, racking, bottling, &c., it is almost impossible to give fixed rules. Practice and a nice discrimination of any change in the wine is absolutely necessary to manage it successfully. As a general rule wine is not fit to bottle before it is a year old, as young wine always contains more or less sediment and lees, even if it should seem to be perfectly clear. Let no one become discouraged, however, if wine-making should appear to him a more complicated business than he had at first supposed. A love of the subject and earnest application will soon show the way. Make experiments, watch their results closely, and practice will soon make perfect. There is, however, an easier way to do this than for each individual to make his own way alone. It is the formation of grape colonies, of grape growers' villages. The advantages of such a colony will be easily seen. If each one has a small piece of suitable land, (and he does not need a large one to follow grape-growing,) the neighbors can easily assist each other in ploughing and subsoiling; they can join together and build a large cellar in common, where each can deliver and store his wine, and of which one perhaps better acquainted with the management of wine can take charge, or a competent person be engaged for that purpose. An association of this kind generally has the preference in the market over a single individual, and obtains a higher price for products if of a good quality.

In a country which has such an immense amount of lands suitable for grape-growing, and where it is to become at no distant day one of the leading agricultural interests, it would be very desirable, in my estimation, to create a separate department of grape culture and wine-making to be connected with the Agricultural Department; and of which a practical grape-grower and practical wine-maker should be the chief, whose duty it should be to conduct experiments, travel frequently, and impart that instruction and advice so much desired and needed by our grape-growers. Such an institution, properly conducted, would be of immense advantage to the country, and under the fostering care of our government, extended to this important branch of industry, America would soon become the greatest wine-producing country on the face of the globe.

If we had more frequent exhibitions of wines, and agricultural and horticultural societies throughout the country would do a little more for the grape-growing interest, instead of giving it the tail end of the premiums, as has generally been done, we would progress faster.

These are but hints. If they should create general discussion on the points referred to—if they but help to awaken the public interest—my object has been accomplished.

PARIS EXPOSITION REPORT.

CULTURE AND PRODUCTS OF THE VINE.

The following is a report, to the United States commission at the Universal Exposition of Paris, in 1867, of the committee "on the culture and products of the vine:"

The exhibition of wines at the Universal Exposition of 1867 was large.

Every wine-growing country of Europe, as well as Australia, Canada, California, and other sections of North and South America, were represented. As there were no jurors from the United States, our American wines were not subjected to so full and fair an examination as they were entitled to, and to remedy this omission a special committee, consisting of the undersigned, was appointed by the board of commissioners to make an examination of the wines of our own and other countries, and to report especially with reference to wine-growing in America. To properly judge, however, of the different kinds, of the qualities, cost, sanitary influence, and adaptability to our country—points upon which we would have been glad to report more fully—would require more thorough tasting and more time than the committee could command, or had a right to demand from the courtesies of foreign exhibitors or commissioners.

As regards French wines, full reliance cannot be placed on what is furnished to the American traveller at hotels or cafés, or even what is sold him at the shops, no matter what price he pays. It would, however, be doing French wines a great injustice to judge them by the qualities sold in this way, or exported to America. The great body of American consumers have palates as yet so unskilled, and the merchants of Bordeaux and fabricators and imitators are so adroit, that it seems impossible for the honest wine-grower here to come into such relations with the wine-drinkers there as shall secure to the latter the benefits, sanitary and moral, which the French people themselves derive from the pure juice of the grape so abundantly produced in this country. It is not an unusual practice for dealers to buy of producers in the back country a coarse, deep red wine for 30 cents per gallon, and a strong white wine for 45 cents per gallon, mix and bottle them, and send them abroad labelled with all the high-sounding names of "Medoc," to sell at enormous profits to unsuspecting foreigners.

Further south than Bordeaux, in the country about Montpelier and Beziers, an inferior article, but perfectly pure, can be obtained of the producer at five and six cents per gallon, or one cent per bottle. Of late years, and since the abatement of the grape disease, the production of France has been very large, the 4,000,000 of acres in cultivation yielding an average of 1,200,000,000 of gallons, which would give to every man, woman, and child in the country a half bottle-full every day, even after allowing 200,000,000 of gallons for exportation.

Owing, perhaps, to the intimate relations between America and Germany, our wine commerce with that country is conducted in a much more satisfactory manner. A good deal of excellent German white wine now makes its way to us, and is highly appreciated.

Hungary, whose product is second to that of France only, can supply a wide range of varieties, and at prices extremely reasonable. As the Hungarian producers seem to know, as yet, but little of chemistry, we suppose their wines to be generally pure, and as they are not yet fully introduced into the markets of the world, we should think they might be advantageously purchased to a greater extent than has yet been done.

Besides the sherry, of which we consume so largely, Spain has an abundant and rich vintage, with which American consumers would be better acquainted if her merchants had more of the enterprise of those of Bordeaux.

Portugal also produces plenty of excellent and pure wines of which we know little, for hardly a drop is allowed to leave the country without being so strongly brandied as to lose its character as a wine, and become rather a spirituous liquor. Port wine is repeatedly dosed with spirits until it contains at least as much as 24 per cent. of alcohol. Fifteen years' age is required before it is fit to drink, not because the wine is slow to ripen, but because the spirit needs to remain 15 years before the disturbance it causes can subside, and the antagonistic ingredients of the mixture harmonize.

Notwithstanding bold and persistent assertions to the contrary, it has been sat-

isfactorily proved to your committee that the adulteration is made not to preserve the wine, but solely to make it sweet and stimulating.

As America is destined to become a great wine-producing country, her people ought to be better acquainted than they are with the higher grades of foreign wines, but they have as yet drunk so little of these, that their standard of excellence remains comparatively low. Now, except in California, none of the European vines will grow in America, and we are compelled to search in our forests, and develop in nurseries and vineyards the varieties which are in the future to be our reliance for competing with foreign producers, and finally, it is to be hoped, emancipating ourselves from them altogether. Of course, then, the higher our standard of taste, that is, the higher our aim, the better will be our success. Our vine-growers have much more to learn of the character and quality of good wines than they have of cultivation and manufacture, for really, as to the preparation of the soil, planting, cultivating, pruning, and training the vines, gathering, selecting, and pressing the fruit, fermenting, and keeping the wine, (white wine, at least,) our experienced vignerons have but little to learn of European rivals.

Our American vineyards compare very well with those of France, and so do our cellars, presses, and casks, so that an elaborate report on methods would be of but little benefit, and might even mislead, for there seems to be no one method in use here, in any stage of vine-raising or wine-making, concerning which there is not a confusion of practice and a conflict of theory, such as it would be hopeless to attempt to reconcile. Probably sound reasons for much of this diversity may be found in peculiarities of soil and varieties of vines that are local and special, and with which we have nothing to do. Still, a pretty thorough tour among the vine districts of France has not been wholly barren of suggestions.

CULTURE OF THE VINE IN EUROPE.

Soil and exposure.—The soil of Medoc, where stand "Chateau Margeaux," "Chateau La Fitte," and "Chateau La Tour," is a bed of coarse gravel, among whose pebbles the eye can barely detect soil enough to support the lowest form of vegetable life. In the vicinity of Beziers, on the other hand, the land is rich and strong enough to yield any kind of a crop; yet Medoc grows wine that often sells for ten dollars per gallon, while that of Beziers sometimes sells for the half of ten cents per gallon. In Burgundy there is a long hill, on whose dark red ferruginous limestone sides a wretched thin covering of earth lies, like the coat of a beggar, revealing, not hiding, the nakedness beneath. Here stand little starveling vines very slender and very low; yet here is the celebrated "Clos Vaugeot," and this is the hill and these are the vines that yield a wine rivalling in excellence and value that of Medoc, and to the fortunate proprietor the *Coté d'or* is what it signifies, "a hillside of gold." At its base spreads out a wide and very fertile plain, covered with luxuriant vines, whose juice sells at from ten to twenty cents per gallon.

If you go further northward and examine the hills of Champagne, you will find them to be merely hills of chalk; and these instances only illustrate the rule derived not from them alone, but from abundance of others, that, for good wine, you must go to a dry and meagre soil. Yet we should be sorry to have to extend the rule, and say that the poorer the soil the better the wine, for there are certainly very few patches of ground in America that can match in poverty the mountains of Champagne, the hills of Burgundy, or the slopes of Medoc; nor would it do to conclude that manure should not be applied, for although some say it is hurtful to the wine in its quality, it is yet an open question whether this is so or not. Meanwhile, the practice is to manure, although sparingly.

Preparing the ground and planting the vines.—This is probably as well understood in America as in France. We usually break up to the depth of two feet

and drain thoroughly. In many parts of France they trench to the same depth, but in many other parts this is impracticable, unnecessary, or injurious. Here, the distance between the vines is from eighteen inches to two feet, according to their size. We, however, are compelled, by the greater vigor of our vines, to place them five and six feet apart.

In Burgundy, Champagne, and some other districts it is the practice to renew the vigor of the vines, by laying down the cane and rooting the plant in a new place, which quite breaks up the original lines, so that the plough cannot be used. This is doubtless a good way to renew the strength of the plant, but it is objected to by high authority, on the assumption that the older the stalk the better the wine will be; on the other hand, Champagne wine dressers have attributed to this practice in a great measure their almost total exemption from the vine disease. Others, however, attribute that exemption to the general and long established custom of spreading over the vineyards a bituminous shale containing sulphur, a well-known antidote; and here we would recommend most strongly to our countrymen a renewed and sustained effort to combat mildew with sulphur. The experience of France and other countries is entirely in its favor, and its use is still felt to be necessary, and is still kept up.

We think Americans have not been thorough enough, and patient enough. Let them try again, and this time let them begin early, and to be sure to follow carefully these rules on the subject, which have been hitherto much better promulgated than observed. On rich and level land, a common plan in some districts is to set out double rows of vines at wide intervals, in fields chiefly devoted to other crops. The free exposure to sun and air thus secured seems largely to augment the yield, and this will be understood by any one who has noticed the superior productiveness of such of his vines as grow bordering on a wide alley or other open space. This is very different from planting vegetables, &c., among the vines, which is a bad practice.

Wire trellis.—These are becoming quite popular here, as we think they are in America also, notwithstanding the cheapness of wood. The size of wire preferred is number 16, and but two wires are used. Our large vines would need three wires. They are stretched to strong posts set 20 feet apart, passing intermediately through holes of smaller posts or stakes. On the lower line, about 18 inches from the ground, the fruit-bearing wood is trained, while the upper line, about 18 inches above the other, supports the new wood. Many prefer to allow the fruit-bearing cane to do service two years, instead of one only, as is the practice in America. There is no doubt that with wire trellis the pruning, tying, pinching off, &c., can be much more cheaply done than where the training is to stakes, and from the way the clusters depend from the horizontal cane, it is easy to see that there must be also a superior access of sun and air, and a greater ease in gathering the vintage.

Winter protection.—It is a common practice to go through the vines with a plough every fall, and throw up a good ridge of earth against the stalks. The Hungarians have a more effectual way of guaranteeing against the cold of their rigorous winters, which is to lay the vines on the ground, cover them with straw, and on the straw throw the earth; without this it is said they could produce no wine at all. Our native grapes are generally hardy, and will live wherever their fruit will ripen, but occasionally there is a severe season which seems to touch the very heart of the wood, and so enfeebles it that it falls an easy prey to disease. It was noticed that the mildew set in with great destructiveness after the two hard winters of 1854 and 1856.

The thorough covering employed in Hungary would secure the wood against such occasional risks, and also might render it possible to grow European vines in our country. By this means, too, we could, perhaps, make the Scuppernong live in our northern States, and obtain from it a sparkling wine, of foam and flavor unsurpassed. From these considerations and others, we recommend to the

wine-growers of our more northern States to lay down and thoroughly cover their vines regularly every fall; and to those in milder regions, to bank up the earth against the stalks as is done in France.

Vine-dressing.—We have derived most of our instruction in vine-dressing from the Germans, in whose native country there are no sunbeams to spare; and the celebrated "Riesling" grape is said to hardly ever ripen, and thus, perhaps, we have been led to attach too much importance to letting the fruit remain on the vine as long as possible before gathering. If we have been in error, it would be well worth while to know it, for, besides the loss by shrinkage, the ravages of insects and birds, quadrupeds and bipeds, during the last fortnight of the vine-dresser's watchings are most disheartening.

PRODUCTION OF WHITE AND RED WINES.

Now, it is contended by good authority in France that early vintages are the best, and that it is important, not merely in regard to quantity but quality, also, to gather the fruit before it becomes over-ripe. Possibly what is true of white wine may not be so of red wine, to which last named kind, attention is so widely directed in Europe. Here the proportion of white wine to red is very small, and it may be said that red is the rule and white the exception.

Our wine-growers in America understand very well the principles to be observed in the manufacture of white wine, and many of them, as regards care and nicety, are as good models as need be desired. But it cannot be denied that the practice of selling the ripest and finest grapes for table use, and converting the unsalable into wine, prevails to a great extent among American vineyardists, and the result is the manufacture of much inferior wine. This has already injured the reputation of American wines, both at home and abroad. Of the much more complicated process of making red wine, however, American manufacturers are but little informed, for the reason that until recently they have had no grapes suitable for the purpose; but now that we have discovered those excellent varieties, the "Norton" and "Ives" seedlings, our estimate of the value of which has been very greatly raised by comparing wine from them with some of the highest grades of foreign productions, a few observations of methods of fermentation for red wine as practiced in France may be appropriate.

In France they will make either white or red wine from the same grape; but in America we have grapes whose pulp is so rich in coloring matter that they yield a very pretty tinted wine without any further treatment than what is given to make white wine, and a pure white wine cannot be made from them; of this kind is the "Norton" seedling. Yet not for beauty alone do they put them through the process of fermentation on the skin, but because that process imparts qualities which, as affecting the palate, stimulation, digestion, &c., are quite different from what the other process imparts. Many persons find red wine essential to their health, who cannot use white wine, and *vice versa.*

MANUFACTURE OF WINE.

Stemming.—The fruit having been gathered and selected, the next thing to do is to stem it. In "Medoc" and all the "Bordelais" this is invariably done. But in "Burgundy" and other districts they commonly omit it, and throw stem and all into the vat; if, however, the season has been bad, and the stems remain unripe, they are of necessity excluded in whole or in part, lest they do more harm than good. The chief reason for putting in the stems is to correct the disease called "tetter," for which the tannic acid, &c., of the stem is thought to be an antidote. Fortunately we know comparatively little, as yet, of any wine disease, except acidity, but still it will remain for us to decide upon experience which of the two methods it is best to adopt. Probably we shall arrive at the same diversity

of practice as is witnessed here. Stemming is usually done by rubbing the fruit upon a grating of iron rods, but the better way decidedly is a grating of wood. It is made of bars two-thirds of an inch square, carved into each other where they cross so as to bring them down to an even face, leaving openings or meshes two-thirds of an inch square. This is established like a table with four legs, with a rim around it about ten inches high, and a proper receptacle beneath to receive and carry off the stemmed fruit as it falls through and the juice which escapes. The table is four feet square and four feet high. About three bushels of grapes are put upon the grating, which four men with bare arms soon rub through, leaving the stems behind, which are then thrown into a small circular press, like our hand cider presses, which extracts the juice of the few grains remaining on them. In this way four men can stem enough to make fifty barrels of wine per day. For one who makes but a small quantity, a deep tub and a three-pronged stick will do very well.

Crushing.—This is next to be done, by trampling the grape with the naked foot. It is said to be a better way than to use a large mill, for the reason that the mill will crush the seed; but the seeds are not easily crushed, and a properly made grape mill need not bruise them in the least. At a well managed wine-house, that of Messrs. Averons Brothers, in "Pauillac," they put the grapes to ferment with no further crushing than what is given them in the process of stemming, which experience has satisfied those gentlemen is all that is needed.

Treading out grapes with bare feet is well enough if the feet first be made clean, but probably no American will ever adopt the plan of crushing with the naked feet, either clean or unclean, but will either rely on the crushing given in the stemming process, or use a mill, or a bucket and tripod.

Fermentation.—The crushed mass, with or without the stems, is next thrown into vats and allowed to ferment. The vats are large casks, generally without bulge, the largest at the bottom, and open at the top. In some of the large houses they are covered with loose boards; in others the boards are jointed and made hermetically close by plastering with cement or clay; in others there is merely a floating mass of stems; and in others there is no covering at all except the scum of stems, skins, seeds, &c., which rise to the surface.

After the fermentation has ceased and the wine becomes clear, it is drawn off and put away in close casks, which in France are almost uniformly of the size called "barrique," holding about fifty gallons. In Burgundy these are kept above ground and in the light until spring, and then put into cellars, while in the Bordeaux country they remain in the light in storehouses above ground until one or two years old, and are then removed to dark rooms on the same level. A careful way of making red wine out of grapes not fully ripened is to allow it to remain in the vats for a sufficiently long time after fermentation to let the greenness held in suspense settle to the bottom.

At "La Tour," in the vintage of 1866, they allowed the wine to remain in the vat a whole month, though the fermentation was probably complete in half of the time. After drawing off the remaining undissolved pomace, it is pressed and made into a wine of inferior quality. It is common in France, and it would be sometimes necessary in some parts of America, to provide means of warming the wine-house up to at least 20° Centigrade, or 68° Fahrenheit, as well as to introduce steam heat into the vats themselves, which is done by means of a tin pipe, entering to the right of the faucet and a little above the bottom of the vat, bending to the bottom and rising again in the form of the letter U, and then passing out at the other side of the faucet, at the same distance from it, the steam entering at one end and the condensed vapor escaping at the other; but heat is only applied in cold seasons and when the grapes are badly ripened.

VARIETIES.

In France, the fruit of different varieties is commonly mixed together, and generally but little account is taken of "cesaye" (variety) as compared with the quality of soil. Well-informed persons, however, are disposed to complain of the introduction, which has been quite general of recent years, of coarse varieties, grown for quantity rather than quality.

There is one variety of vine commonly seen on rich soil and deemed unfit for poor ground, except where grown for brandy, as in Cognac, that may possibly be of value to us. It is called "la folle," (the crazy;) "en ragat blanche," (from enraged.) Except in its infancy it needs no stakes, but holds itself erect by the strength of its stalk, which is trained about one foot high, and from which the cane or branches shoot out with great vigor, like those of the osier willow pruned low. Every winter all the branches are cut back to two or three eyes, and during the season the ground is cultivated in the usual manner, but further than this it demands no attention. There is no summer pruning nor any tying, winter or summer. It is never hurt by frost, is proof against all disease, and is unfailing in its fruiting, and yields, when in good condition, 1,200 to 1,500 gallons of wine per acre. Its most favorable soil is a sandy loam, and when grown on such its wine, which is quite strong, is worth 40 cents per gallon. Of that produced about Bordeaux a good deal is mixed with coarse red wine and made into claret for American consumption. Of itself it will not make red wine. It is possible that this hardy vine or grape will stand our severe winters, and, with or without covering, obtain a footing in American soil. If so, every farmer, or whoever else can command a quarter of an acre of land, might raise for his own table an abundance of good sound wine at a trifling cost. Generally it is bad policy to introduce a coarse plant of any sort, but we have so vast a spread of land that is too rich for growing delicate wines, no matter what variety of plant is tried, and of late the mildew and rot have been so discouragingly fatal in many parts of the country, it might be well to give the "en regat" a trial, and since we must drink the juice baptized with the names of "St. Julian," "Chateau," "Margeux," and all the saints of Medoc, we may as well enjoy the satisfaction and the very large profit of raising it ourselves.

Not only do the French mix different kinds of grapes in the vat and on the press, but they freely compound together different kinds of wine in all stages of maturity. This is done of course with great carefulness, the success of the merchant in his business depending on his skill in concocting what will please the palate. Such combination may be agreeable to the taste of the consumer, and profitable to the merchant, but it may well be doubted if it is as good for the health as that which is simply natural, and made from one variety of grape.

A French wine-grower has introduced the Catawba into his vineyard, and uses its juice to mix in very small proportions with that of native grapes to give flavor. Any considerable addition of the Catawba's musky quality would be more than the French palate, trained to like only that which is negative, could very well bear.

When American wines were tested by the jury at the Exposition, the French jurors, whose scale was from one to four, with a zero at the foot, generally complimented our Catawba with a zero, and they remarked that the more of the natural flavor the wine possessed, other things being equal, the lower they should estimate it. In America the very contrary is known to be the case. The German jurors, accustomed to wines of high bouquet, held quite different opinions from the French, and were much pleased with the American wines.

TREATMENT OF WINE.

In regard to the more delicate wines of Europe which do not bear exportation, an important discovery is said to have been made by the distinguished chemist,

Pasteur, of the Institute, which is exciting great interest, and promises nothing less than to secure wine against disease and deterioration for an indefinite period, to enable it to be transported with safety any distance, and kept in any sort of storehouse. The best way to make known in America the discoveries of Mr. Pasteur would be to translate and publish his very valuable work, entitled "Etudes sur le Vin," sold by Victor Masson & Sons, Place de l'Ecole de Medicine, Paris. Meanwhile we will give a brief synopsis of it.

After explaining at length the nature of the different diseases of the wine, acidity, bitterness, &c., tracing them all to vegetable parasites, and detailing his experiments in search of an agent to destroy the parasites, Mr. Pasteur arrives at the conclusion that they are effectually destroyed by heating the wine up to a point between 50° and 65° Centigrade, which would be between 122° and 149° of Fahrenheit. The heating can be done in a "Bain Marie," that is, by placing the bottle or cask in a vessel filled with water and heating the water, or by hot-air closets or steam-pipes introduced into the casks. The heating should be gradually and carefully accomplished in order to enable any one to test the value of this invention, so important in its aims.

We extract the following, which gives all the author has to say on the mode he has himself followed with wine already in bottle, whether new or old, diseased or sound:

> The bottle being corked, either with the needle or otherwise, by machine or not, and the corks tied on like those of champagne bottles, they are placed in a vessel of water; to handle them easily, they are put into an iron bottle-basket. The water should rise as high as the ring about the mouth of the bottle. I have never yet completely submerged them, but do not think there would be any inconvenience in doing so, provided there should be no partial cooling during the heating up, which might cause the admission of a little water into the bottle. One of the bottles is filled with water, into the lower part of which the bowl of a thermometer is plunged. When this marks the degree of heat desired, 149° of Fahrenheit for instance, the basket is withdrawn. It will not do to put in another immediately; the too warm water might break the bottles. A portion of the heated water is taken out and replaced with cold, to reduce the temperature to a safe point; or, better still, the bottles of the second basket may be prepared by warming, so as to be put in as soon as the first comes out. The expansion of the wine during the heating process tends to force out the cork, but the twine or wire holds it in, and the wine finds a vent between the neck and the cork. During the cooling of the bottles, the volume of the wine having diminished, the corks are hammered in further, the twine is taken off, and the wine is put in the cellar, or the ground floor, or the second story, in the shade, or in the sun. There is no fear that any of these different modes of keeping it will render it diseased; they will have no influence except on its mode of maturing, its colors, &c. It will always be useful to keep a few bottles of the same kind without heating it, so as to compare them at long intervals with that which has been heated. The bottle may be kept in an upright position; no mould will form; but perhaps the wine will lose a little of its fineness under such condition, if the cork gets dry, and the air is allowed too freely to enter.

Mr. Pasteur affirms that he has exposed casks of wine thus heated in the open air or terrace, with northern exposure, from April to December, without any injury resulting.

Wine in the casks may be heated by introducing a tin pipe through the bung-hole, which shall descend in coils nearly to the bottom and return in a straight line and through the pipe imparting steam. If, after thus once being heated, there is such an exposure to the air, by drawing off and bottling, as to admit a fresh introduction of "parasites," the disease thus introduced may be easily cured by heating a second time.

Mr. Pasteur also claims to have discovered and proved that wine can be advanced in ripening and improved by "æreation" conducted in a slow and gentle manner. This is a bold assertion, but such confidence is felt in the value of suggestions coming from him that both of his methods, cutting, as they will, a tangle of old theories, will have a fair trial by his countrymen, and that without delay.

Your committee would say, in conclusion, that from what comparison we have been able to make between the better samples of American wines now on exhi-

bition at the Paris Exposition, with foreign wines of similar character, as well as from the experience of many European wine-tasters, we have formed a higher estimate of our own ability to produce good wines than we had heretofore; and from our investigations in vine culture we are now more confident than ever that America can and will be a great wine-growing country. All that is necessary for us to rival the choicest products of other parts of the world, will ere long come with practice and experience. We have already several excellent varieties of the grape borne on American soil, and suited to it a soil extensive and varied enough for every range of quantity and quality. Who would discover a patch of ground capable of yielding a "Johannisberger," a "Tokay," or a "Margeaux," need only make diligent and careful search, and, somewhere between the lakes and the gulf and the two oceans that circumscribe our vineyard territory, he will be sure to find it.

Finally, your committee cannot close this report without acknowledging the many courtesies extended to them by European exhibitors and commissioners in facilitating the investigations incident upon the discharge of their duties.

MARSHALL P. WILDER,
ALEXANDER THOMPSON,
WILLIAM J. FLAGG,
PATRICK BARRY,
Committee.

SUPPLEMENT.

VINE DISTRICTS OF SWITZERLAND AND GERMANY.

The committee, since making their report on the third branch of the subject given them in charge, have visited the principal vine districts of Switzerland and Germany, and deem some of the observations there made worth being embodied in the supplemental report now submitted.

The vineyards to which attention was more especially given were those of the borders of Lake Geneva, those of Pfalz or Rhenish Bavaria, and of the banks of the Rhine, the Neckar, and the Main.

With regard to the quality of the soil, we have the same remark to make here as was made in the former report, viz, that the vines yielding the best wine were found to be growing on the poorest soil. Geologically, the soil throughout all the above districts is very much the same, viz. basalt and sandstone, both formations usually seen in close proximity, the basalt uppermost and resting on the other. The only exceptions were a few patches of limestone and slate. The basalt soil is esteemed richer than the sandstone, and is often hauled on to the other to enrich it. For instance, the vine-dressers of Durkheim actually manure their thin, poor, gravelly land with tens of thousands of yards of earth, brought from the neighboring town of Deidesheim, and yet the Durkheim wine is quite superior to that of their neighbors. All this was quite different from anything we noticed in France; there, calcareous rocks seem to underlie everywhere, nor could we learn of any wine of high repute in France that derived its quality from sandstone or basalt. The vine husbandry of the Swiss and Germans is of the first order. Nowhere do you see in their vineyards the straggling appearance so common in those of France, (the effect of frequent layering;) but the lines are always beautifully true and even. Although intervals or rows were wide enough for the plough to pass, nearly all the cultivation was done by hand, and done most thoroughly, too. In France, as in America, they stir the ground two or three times during the season. In the Rhinegan it is done four times; but about Forst Deidesheim and Durkheim they do it as often as every two or three weeks from the beginning to the end of the season. It is in the above neigh-

borhood that basaltic earth is applied as a manure, as is also clay, to make the ground more retentive of manure; and this they do to such an extent that old vine fields are seen which have been raised visibly above the level of the others adjoining them.*

The expenditure of labor in a year on an acre of those fields amounts to about 140 days' work. In the Pfalz, it is usual to train upon horizontal laths or lines of wire running 15 inches above the ground, very much as is done in Medoc, only that where wire is used a second line is stretched above the other. If the plan is good in Medoc and the Pfalz, it is hard to see why it would not be good everywhere, especially in countries so cold as Germany and the northern part of the United States. Indeed, Mr. Guyot, to whose book we have already referred, argues strongly in favor of everywhere adopting the method of training the fruit-bearing cane horizontal with the ground and very close to it. We ought, however, to note here, that the fields where this mode was more particularly noticed, or connected with good results, were in gravelly deposits of nearly level surface. Manure is freely used in Germany, much more so than in France, and is prepared and applied with much care and system. *Cow manure*, largely composted with straw, is the only kind thought fit to manure vines. They sprinkle the heaps almost daily to keep them moist and allow the mass to rot, at least 12 months before being used. It is applied every three years. As to quantity, it is certain that some soil, like the poor and unretentive gravel beds of the Pfalz, should receive more than those of the neighboring slopes, and that the calcareous earths of France need less than the sandstone and the basaltic earths of the Rhine valley.

Guyot, arguing strongly in favor of manure, recommends the French cultivator to put on at intervals of three years a quantity of manure that will be equivalent in weight to that of the fruit he has taken off at vintage, while Mr. Herzmansky, the steward at Johannisberg, who tills some 50 acres of vines, keeps about 40 very large cows in his stables. *But will not manuring hurt the quality of the wine?*

In our former report we say that this is an open question as yet, and so it is in France, and Mr. Guyot treats it as such in arguing upon it. Of course none will doubt that were a vineyard to be treated in this respect, as we treat the soil of a grapery, very poor wine would be produced, and the only question is, will a moderate quantity do harm? This is precisely the question the committee put to Mr. Herzmansky, the intelligent and thoroughly experienced director at Johannisberg, where the best wine in the world is made. His answer was, "No. As we apply it on this soil it does not impair the quality of the wine in any degree; on the contrary, it improves the flavor." Then he led the way to his well-ordered cow stables, and pointing to the compost heaps remarked, "There is the beginning of Johannisberger."†

Now Johannisberger is the most delicate of wine, as it is indeed superlative in every respect. By the kind invitation of the Princess Metternich the com-

* Some years since the vineyard of F. T. Buhl, of Deidesheim, produced wine on the natural soil of a very inferior quality, selling at 50 centimes the litre, at a very great expense. The whole vineyard was covered to the depth of three feet by volcanic or basaltic earth brought from a distance of several miles. The experiment at the time was thought to be a very hazardous one, but the enhanced value of the wines after the addition proved that the owner was wiser than his neighbors.

† The vineyard of F. T. Buhl, alluded to in a previous note, is fertilized by a compost made of wood-ashes, stable manure, and earth. This is applied in the spring in trenches dug to the depth of about ten inches and again covered with earth; the application is made in this manner to every alternate row in the vineyard. The following year the same process is gone through with in the remaining rows, by the removal of the soil as previously stated, and the treatment of manure as just detailed; this vineyard now produces wine of a very superior quality, of a delicious bouquet, rich in saccharine matter and alcohol, and possessing all those excellencies that we prize in a first-class wine, and is now readily selling at twelve francs the litre. To which is this wine most indebted for the extraordinary change in its character—to the volcanic soil, or the manure which is annually buried in the vineyard?

mittee were allowed to taste specimens of the best the castle cellar contained, including some that was 21 years old in the cask, and some from a cask that was, *par excellence*, called the "bride of the cellar," and the opinion formed was that the quality of Johannisberger is such that it cannot be described, and can be communicated only to the organs of taste, nor can it be understood or even imagined, except by those who are so highly favored as to have a taste of it. But this marvellous wine is but the crowning product of the famous district of the Rhinegan, or that portion of the valley lying just north of Mayence, a strip less than ten miles in length, whose fruit yields a juice which surpasses all others of the world, combining richness with flavor and delicacy with strength. The soil of the Rhinegan seems to be of a red sandstone mostly, if not wholly. Johannisberg hill reminds one strongly of the soil of some parts of New Jersey and Connecticut, and in the neighborhood of New Haven, in the latter State, the "basalt" is seen resting upon the red stone, just as it does upon the hills that skirt the Rhine. Nearly all the German and Swiss wines, and, indeed, nearly all the grapes grown in Germany and Switzerland, are white, for which the soil and climate of the former country seem peculiarly adapted, while at the same time unsuited for ripening colored grapes to the tint needed in a true red wine. The peculiarity of the better sort of Rhenish wines is "bouquet," and of the inferior sort, acidity; compared with them, their French rivals are quite negative, and so are those of Switzerland. A French wine, white or red, must be very poor indeed if it shows any acidity, and must be very fine indeed if it possesses any easily-tasted "bouquet." Altogether, we must award the palm of excellence to the white wines of the Rhine, as we do to the skill and industry of the vine-dressers who produce them. In considering the merits of the different soils as geologically distinguished from each other, we seem drawn to the conclusion that, so far as our observation has gone, the red sandstone is the superior one, but we confess ourselves unfit to make any such sweeping generalization, and will only say that the soil in question, for aught we can see, seems as fit as any other to grow a superior wine. The difference between wine made by fermenting the bruised grapes, juice, skin, pulp, and seeds altogether, and called "red wine," and that made by pressing immediately after gathering and fermenting its pressed juice by itself, called "white wine," is not a difference of color alone. For certain bodily temperaments, and for certain conditions of health, possibly, too, for the peculiar constitution of the German people, *white wine* may be the best. And to that of the Rhine country Liebig attributes the virtue of being an antidote for calculus and gout. But all this being admitted, the better reasons seem to favor the production and use of the red wine in preference to the white where it can be done. The testimony we have obtained from the best sources of knowledge on this point amounts to this:

Red wine is much less heating, much more tonic, much less exciting to the nerves, much less intoxicating to the brain, and its effects are more enduring, than white wine. As we of America are, by reason of our dry climate, as well as from moral causes, more excitable, both from brain and nerve, than the Europeans, and at the same time much oftener in need of tonic diet, and our summer heats are so much more intense than in the wine latitudes of Europe, all the above considerations should have peculiar weight with us. So highly, at least, do the French people appreciate them, that they consume now little white wine, and it bears always a lower price in the market than red of equal quality. To the general consumption of this drink intelligent Frenchmen are apt to attribute the fine health of their peasantry, as well as their habitual gaiety and habitual temperance. (The habitual use of *whiskey* has quite another effect.) An American gentleman, for many years residing in France, and for a time a professor in one of the universities, affirms that the greatest longevity is among those people who take red wine three times a day and abstain from both tea and coffee. When Americans consult French physicians, three times in four

they are ordered to drink red wine as a habitual beverage, and one of the commonest daily events among Americans residing in Paris is the cure of an obstinate dyspepsia by the same simple remedy, even in the unhealthful air of that city.

The German vineyards have hitherto escaped any very serious ravages from the "vine disease." It is met as often as it appears, and successfully combatted with sulphur. Three applications are made, the first as soon as the berries have grown to be as large as the head of a pin. Early in the day, and before the dew is dried off, the flour is sprinkled on the lower surface of the leaves, where the moisture causes it to attach. The implement used is a tube of tin, perforated with numerous small holes at the lower end, and with a tassel of woollen yarn attached to that end. At Rheims we were shown a large vine, trained to a wall, one-half of which had been treated as above in the spring of the year before, and the other half neglected. The latter had, as a consequence, lost all of its fruit, and we visited the place and saw it the following season. It showed yellow and falling leaves in July, and very little fruit, while the other portion was perfectly healthy, and was loaded with a good crop of fruit. This experiment was made by a French gentleman, who had recently returned from a long sojourn in America, and visited that country for the purpose of satisfying himself if the sulphur be really a preventive or not against the vine disease, of which he had heard so many doubts expressed while in America.

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RICE CULTURE.

By Augustin L. Faveau, South Carolina.

Upwards of a century ago one of those accidental circumstances so often fruitful of important results occurred in South Carolina. A vessel from the coast of Madagascar sought refuge in the harbor of Charleston, and the captain, having formed the acquaintance of Landgrave Smith, presented him with a bag of "paddy," or "rough rice." This the landgrave caused to be planted in his garden, at the corner of Tradd and Church streets, in the city of Charleston, and so encouraging was the result that much attention was soon attracted to the plant; and from this small beginning originated the entire supply of seed whose product, in the year 1860, formed so important an export commodity of this country that it amounted to 162,000 tierces, or 100,000,000 pounds, valued at $4,000,000.

LANDS ADAPTED TO RICE CULTURE.

In this article I will confine my attention chiefly to what is known as golden or Carolina rice. There is a species of bearded white rice, known as Highland rice, but as it is unknown to commerce, of very limited culture and inferior quality, and not suited to the system of cultivation herein to be described, it will not command my attention.

The lands best adapted to growing rice are those swamps and rush lands lying immediately adjacent to tide-water rivers, between 29° and 35° north latitude. For the purpose of economical and successful irrigation they must be perfectly level. They are always alluvial, and consist of blue clay, yellow mottled clay,

or black bay lands. The former two contain a large per cent. of isinglass, highly important to their value. There is another class of lands adapted to rice culture, known as inland swamps. These are large basins or lakes, surrounded by highlands, having water leads running into them, by which they are inundated. These basins, being drained, are easily reclaimed, and a portion is usually set aside as a reservoir for holding a sufficiency of water for irrigating purposes.

These lands, though not usually so prolific as the river swamps or tide-water lands, generally, under good management, produce a heavier grain, which is much sought after for seed. As a general rule they have heavier soils, are harder to cultivate, and not so remunerative as the river swamps.

PITCH OF TIDE.

Tide river plantations are usually located a little above the junction of salt and fresh water, and extend up the banks of the rivers so far as the rise and fall of the tides are sufficient for flooding and draining. This rise and fall should not be less than three or four feet, and six or eight feet is to be preferred, on account of the more perfect drainage these latter figures afford. Rice plantations are located above the junction of salt and fresh water, from the fact that rice, being an aquatic plant, requires a vast amount of fresh water during its growth, salt water being fatal to it at all stages.

HOW RECLAIMED.

These swamps are usually reclaimed by means of embankments or levees, which are made high and strong enough to effectually bar out the river. Smaller embankments, called check banks, subdivide that portion of the plantation lying between the main river embankment and the highland into squares or fields, generally from 15 to 20 acres in area. These squares are all subdivided again into beds or lands, of 25 or 30 feet width, by a system of main ditches and quarter drains. Canals, from 12 to 30 feet wide and four or five feet deep, are sometimes cut from the river embankment, through the centre of the plantation, to the high land, for the purpose of introducing or draining off the water to or from those fields situated far back from the river. These canals also form a very conspicuous feature in the harvest scene, as they serve as a medium of navigation for the large flat-boats which convey the rice to the stack-yard in quantities of 8 or 10 acres at a load; and as rice usually yields from two to three tons of straw per acre, the value of this immense water carriage can be easily conceived.

Flood-gates or trunks having doors at both ends are buried in the embankments on the river, as well as in the canal embankments and the check banks, those at the outlet of canals being so constructed as to permit the flat-boats to pass into the river. By means of these flood-gates or trunks the whole system of irrigation is carried on under the complete control of the planter, and the lands are flooded or drained at will.

CULTURE.

The canals and ditches being all carefully cleaned out, down to the hard bottom—the banks neatly trimmed and free of leaks—the flood-gates and trunks all water-tight, either to hold out or hold in water—the planter commences his operations, as early in the winter as possible, by ploughing. These lands, being yearly enriched by alluvial deposits from the river, do not require deep ploughing, four or five inches being generally sufficient to furnish a good seed bed, and on account of the numerous ditches subdividing the fields a single-mule plough is always preferable. When lands are ploughed early in the winter and nicely "shingled," it is of very great advantage to put in a shallow flow of

water, and suddenly draw it off, in severe weather, for the benefit of "freezing" the furrow slices. But it is not a good practice to flood deep, as the weight of water packs the land, which becomes "run together" by the action of the waves, and renders good harrowing afterward an impossibility. Harrowing is usually begun only a few days previous to planting, in order that the seed-bed may be as fresh as possible, to encourage germination and, by its pliancy, permit the young roots to expand rapidly and take good hold on the soil, in order that the plant may resist the birds and a tendency to float. The operation of harrowing is perhaps one of the most important to the crop, and no consideration must induce the planter to slight it, as this is the golden opportunity afforded him for killing his potent and pernicious enemy—*i. e.*, grass—his dread all the summer time. By breaking up every clod now, and exposing its roots and seeds to the action of the sun, half the battle is won. Immediately after the harrow comes the crusher, which implement is not abandoned until the field is reduced to "garden order." About the 10th or 15th of March, up to the 10th or 15th of May, the process of drilling is carried on—seeding from two and a half to three bushels of clean seed per acre. At this juncture two antagonistic systems are encountered, one known as "covered rice" and the other as "open trench rice." Both have their advocates. The first system, or "covered rice," is where the grain is covered up in the soil two or three inches deep, as fast as it is drilled in, which thus protects it from birds, floating away, &c. The other, "open trench," consists in leaving the rice entirely uncovered in the drill, and taking the risks alluded to, in order to save time and labor, the grain being soaked in thick clay water before seeding, to hold it to the ground.

IRRIGATING.

The seed being deposited, the flood-gates are immediately opened, and, if it be covered rice, and the ground pretty moist, the water is taken in as rapidly as the capacity of the gates may afford; and when it has attained a depth of 12 or 18 inches, or deeper, if the check banks can bear it, the water from the river is then shut off, and the inside gate is closed, to hold in what water is on the field. The trash now rapidly rises, and floats towards the banks, and it must be immediately hauled up with rakes, before it settles down on the rice. In the course of a few days the seed is carefully examined, and as soon as the germ or "pip" appears the water is drawn off the field to the bottom of the ditches, and kept out until the rice has two leaves.

If the grain is planted open trench, as soon as the seeding is done, the water is "leaked" into the field gradually, until the land "sobs" and the rice "sticks;" then it is flooded slowly until the above-mentioned depth is attained; the water is then held until the rice has good roots, or begins to float, and is then drawn off carefully. Here all difference in the culture ceases.

LONG POINT FLOW.

The rice having two leaves—or earlier, if the field is inclined to be grassy—the water is again let in to the same depth as before, completely submerging the plants, and is held to this gauge from seven to ten days, the planter being governed by the weather. If warm, seven; if cool, ten days. Then a "leat" is put in the gate and the water let off gradually, until a general "verdure" is seen floating all over the field. At this point the water is stopped and a mark set upon the gate as a "gauge mark." To this gauge the water is rigidly held for sixty or sixty-five days from the day it first came on the field. This flow, when properly managed, effectually destroys all tendency to "grass," and promotes a vigorous growth of rice. It sometimes happens that, during this flow, the crop takes a check and stops growing. In this event to take off the water is fatal, as it will produce "foxed rice;" but it must be held firmly to the gauge, and in a few days the

plant will throw out new roots and recommence growing. If the maggot attack it in this flow the water is drawn off for a day or two and replaced. And where water is abundant and easily handled, the maggot can generally be avoided by beginning, about the thirtieth day, to change the water once a week. To do so skilfully, both gates must be simultaneously opened at the "young flood." The stale water will thus rush out and fresh water come immediately back with the rising tide to float the rice leaves and prevent them sticking to the ground in their fall. If the maggot gets serious the field has to be dried *nolens volens*. The maggot is a tiny white worm, which is generated by stale water, and attacks the roots of the plant, causing serious injury to the crop. The presence of the maggot may always be suspected by the stiff and unthrifty appearance of the field.

DRY GROWTH.

If the land is fertile at the end of the sixty-day flow, it will be found, on drawing off the water, that the rice has attained a vigorous growth of about three feet, and is well stocked with tillers, while also, if the field is level, and the harrowing and pulverizing was thoroughly attended to before planting, no "grass" will be seen, nothing but rice and the clean soil beneath. The field is kept dry now for about fifteen or twenty days, or until the land dries off nicely and the rice takes on its second growth. And if there be no grass it ought not to be disturbed with the hoe, as the hands, at this stage, often do more harm than good. This, however, does not apply to "cat-tails" and "volunteers," which should, of course, be carefully pulled up by the roots, and sheafed and carried to the banks, to be disposed of by the hot sun.

HARVEST FLOW.

At the end of fifteen or twenty days, as above mentioned, the water is returned to the field as deep as the rice and banks can bear, never, however, topping "the fork" of the former. This water, where circumstances permit, is changed every week or two, by letting it off on one tide and taking it back on the next, and increasing the "gauge" with the growth of the rice. When the heads of the rice are well filled and the last few grains at the bottom are in the *dough*, it is fit to cut, and as little delay is permitted as possible, as the rice now "over-ripens" very rapidly, and shatters in proportion during the harvest. The water may be drawn off the field from three to five days before cutting the grain, and the land will be in better condition for harvesting.

HARVEST.

The rice is cut from twelve to eighteen inches from the ground, depending on its growth, usually from four to six feet high, and the gavels laid evenly and thinly upon the stubble, for the purpose of curing and permitting the air to circulate beneath it. Twenty-four hours in good weather is usually required to cure the straw, and the binding does not commence before this period, and never while the dew is on the straw. It is safer always to cut from sunrise to twelve o'clock, and bind the previous day's cutting from that hour to sunset. As soon as bound the rice is shocked up in wind-cocks, and at the end of a week taken to the barn-yard and stacked up in ricks, 30 feet long, 8 feet wide, and 10 feet high. A stake, four feet long, is put into the rick at each end for daily examination, and as long as the stake does not become too hot at its point to be held by the hand, when suddenly drawn out, the rick is not to be interfered with, otherwise it is to be pulled down, aired, and re-stacked. So soon as the temporary heat is over the grain is fit for the thresher.

As soon as the rice is taken from the field attention is immediately given to

sprouting "volunteer" and "shattered" rice, providing the crop has not been allowed to remain in the field for an indefinite period beyond the week alluded to above. This is best accomplished by instantly flooding the field quite shallow, so as to promote fermentation, and drying it again every 12 or 15 days, for a day or two at a time. This process is continued until freezing weather sets in, and if the season has not been remarkably cool it will be found that most of this grain is destroyed.

THRESHING.

As this operation is performed by steam power, it is generally done with great neatness and despatch. The main building is commonly built on a brick foundation, about 60 feet long by 40 feet wide, having two stories and an attic; the first story being 14 and the second 12 feet high, with what is called by workmen a square roof. At the side of this building is the engine house and boiler room; and in front of the main building, a little distance off, is the feeding room, which is connected with the second story of the same by a covered way which protects the feeding cloth. In the second story is placed the thresher, which, for a first class machine, consists of a cylinder 42 inches in diameter and 36 inches wide, armed with 1,000 teeth. In the rear of the cylinder follow six revolving rakes with spring teeth, all of a diameter and width corresponding to the cylinder. Under the rakes is a hopper which conveys the grain down to two large fans in the first story; from these the grain is taken by elevators and carried to the third, or screening fan, on the second story, whence by elevators and spouts it is deposited into large bins ready for shipment. The feeding cloth consists of an endless canvass, bound with band leather and having slats riveted on it. It extends from the cylinder down to the feed room in the stack yard. The rice is brought in sheaves from the ricks to the feed room, where several hands are stationed for the purpose of placing it on the feed cloth in close succession. The revolutions of the cloth thus keep a continuous stream of grain flowing into the cylinder, which in turn is relieved by the rakes seizing the straw, and after tossing out the grain they throw it out of a window in the rear into straw wagons below, kept ready to receive and carry it away. A good engine, with machinery of this description, will thresh and clean, ready for market, 1,000 bushels of rice per diem. The cost of such buildings, machinery and engine, was, *ante bellum*, about $7,000.

At this stage the grain is called *Anglice*, "paddy"—American, "rough rice;" and is generally shipped to market from the plantation in cargoes of from 3,000 to 5,000 bushels at a time. On arriving there, if "rough rice" is in demand, it is immediately sold in that condition either to European buyers or city millers. The former export it to the European mills, and the latter pound it in their own, and again bring it into market as "clean rice," in tierces averaging 600 pounds net. Good, well cleaned rough rice, weighing 45 pounds to the bushel, will take about 20 bushels to make a tierce of 600 pounds clean rice.

RICE POUNDING MILLS.

As these mills are very costly affairs, they are seldom erected by the planters themselves. The building is a much larger one than that mentioned for threshing, and the capacity of the engine and boilers very much greater.

The rough rice is first ground between very heavy stones, running at a high speed, which partially removes the rough integument, or hull chaff. This chaff is passed out of the building by spouts, and the grain by similar means conveyed into the mortars, where it is beat or pounded for a certain length of time by the alternate rising and falling of very heavy pestles, shod with iron. These are operated by a revolving cylinder of huge dimensions, armed with powerful levers, which, passing into a long opening in the pestle, about 15 feet in length, raise

it in mid air and let it fall suddenly into the great mortars below. From the mortars elevators take the rice to the fans, which separate the grain from the debris. From thence it goes through other fans that divide it into three qualities, known as "whole," "middling," and "small rice." The grain is lastly passed through a polishing screen, lined with gauze wire and sheep-skins, which revolving vertically at the greatest possible velocity embellishes it with that pearly whiteness in which it appears in commerce.

From the screen it falls immediately below into a tierce, which is kept slowly rotating, and struck on two sides with heavy hammers, all the time it is being filled, for the purpose of obtaining its greatest capacity. The tierce, as soon as full, is removed and coopered ready for market. The cost of such a mill was $1,000 per pestle—50 pestles being considered a good market mill.

YIELD AND PROFIT.

Good strong land, at a fair pitch of the tides, well managed and worked with labor that can be depended upon at all times, will average from 40 to 50 bushels of clean rough rice per acre, valued at about $1 per bushel. And ten acres to the hand, with good animal force, and only corn enough for provisions, is easily handled by a good planter, making an aggregate of from $400 to $500 per hand, gross. With the provisions alluded to above, the rice crop is one of the most agreeable and profitable to cultivate; but, on the other hand, if they are wanting, disappointment and failure are the natural results.

CULTURE AND MANAGEMENT OF TOBACCO.

By Walter W. W. Bowie, Prince George's County, Maryland.

SELECTION AND PREPARATION OF SOIL.

A rich loam is the best soil for tobacco plants. The spot selected for a bed should be the south side of a gentle elevation, and as well protected from winds as possible by woods or shrubbery. The land should be warm, mellow, and well pulverized. If bushes can be conveniently obtained, after the ground has been thoroughly raked off, they may be laid on thickly and burned, so as to heat the ground and leave a thick coat of ashes upon it. Since the introduction of guano, burning has not been much practiced. Rake off the leaves and litter, dig deep with grubbing hoes, chop back and rake; continue to chop with weeding hoes and to rake, until every clod, root, and stone is removed, and the bed presents the appearance of a well-prepared hot-bed. After the first digging sow Peruvian guano, at the rate of 400 pounds per acre, and work it in. For every 100 square yards mix one gill of seed with half a gallon of plaster or sifted ashes, and sow evenly, in the same manner as gardeners sow small seeds, only with a heavier hand; roll with a hand roller, or tread down the bed with the feet. If the seed be sown before the middle of March the bed should be covered with bushes, free from leaves, unless they be pine brush, which is the best covering. Sow any time during winter when the land is in order. The best time is from the 10th to the 20th of March, although it is safest to sow at intervals, whenever the land is in fine working order. Never sow unless the land is in good working order; if too wet it will be work thrown away. The beds must be kept perfectly free from weeds and grass, which must be picked out by the hand.

After the plants are up they should receive a top-dressing, about once in ten days, of well rotted and pulverized horse manure, or a mixture of equal parts of stable manure, ashes, plaster and vegetable mould, with soot and sulphur, say four pounds of the latter to four bushels of the mixture. This and other such mixtures have been found efficacious in arresting the ravages of the fly, it being distasteful to the insect; and, from the frequent dusting of the plants, increased vigor is imparted, enabling the plant the sooner to get out of that tender state during which the fly is most destructive to it.

The fly is a small, black insect, somewhat like the flea, and delights in cold, dry, harsh weather, but disappears with the showers and hot suns of opening summer. If possible, the plants should stand in the beds about one inch apart; and if too thick they must be raked when most of them have become as large as a five cent piece. The rake proper for this purpose is a small wooden rake with iron teeth, three inches long, and slightly curved at the points. The teeth are flat, three-eighths of an inch wide, and set half an inch apart.

TRANSPLANTING THE PLANTS.

The soil best adapted to the growth of tobacco is a light, friable soil, or what is commonly called a sandy loam, not too flat, but rolling, undulating land, and not liable to overflow in excessive rains. New land is far better than old. Theory and practice unite in sustaining the assertion that ashes are the best fertilizer for tobacco. Where they are not to be had, and the land requires manure, a mixture of one-third saltpetre to two-thirds gypsum, well mixed, may be applied at the rate of 300 pounds per acre. The land intended for tobacco should be got in nice order by the latter part of May, and when the plants are of good size for setting out, should be scraped, which is done by running parallel furrows with a small one-horse plough, two and a half or three feet apart, and then cropping these again at right angles, preserving the same distance, which leaves the ground divided into squares of two and a half or three feet. The hoes are then used to form the hills, by drawing the two front angles of the square into the hollow, or middle, and smoothing them on top, and patting down by one blow of the hoe. The furrows should be run shallow, for the hills should be low, and well levelled off on the top, and, if possible, there should be a slight depression near the centre, so as to collect the water near the plant. After the first rain after the land has thus been prepared, the plants should be removed from the seed beds and carefully planted in the hills. The smaller or weaker hands, with baskets filled with plants, precede the planters and drop the plants on the hills. In drawing the plants from the beds, and in carrying them to the ground, great care should be taken not to crush or bruise them. When drawn they ought to be put in baskets or barrels, if removed in carts, so as not to have many in a heap together. The plants should never be set deeper than they stood in the bed. The operation is performed by taking a plant in the left hand and inserting the root in a hole made in the centre of the hill with the right. The soil is well closed about the root by pressing it with the forefinger and thumb of the right hand, on each side of the plant, and taking care to draw it well about the bottom of the root. If sticks are used in planting they should be short, and the planter should be careful not to make the holes too deep. The plants ought to be very nicely set, for if the roots are put in bent up or crooked the plant may live, but will never flourish, and perhaps, when too late to replant, will die, and then all the labor will have been lost.

CULTIVATING THE PLANTS.

In three or four days the plants may be weeded out—that is, the hoes are passed near the plants, and the hard crust formed on the hills pulled away, and the edges of the hill pulled down into the furrows. This is easily done if per-

formed soon after planting, but if it is delayed, and the ground gets grassy, it will become a troublesome operation. After weeding out, a teaspoonful of plaster, or plaster and ashes mixed, should be put on each plant. In a few days, say a week, run a small plough twice between the rows, with the landside towards the plants. This is a delicate operation, and requires a steady horse and careful ploughman, for, without caution, the plants will be rooted up, covered over, or killed, by loosening and exposing the roots. In a week after the tobacco cultivator or shovel may be used. Either implement is valuable at this stage of the crop. Once between the rows is often enough for either shovel or cultivator to pass. The crop can be greatly increased by their use in stirring the soil once in 10 days for four or five weeks, going each time across the former cultivation. Any grass growing near the root of the plants may be pulled out by the hand or cut off by the hoe. As soon as the tobacco has become too large to be cultivated without injuring the leaves by the whiffle-tree, the hoes should pass through it, drawing a little earth to the plants where required, and levelling the furrows made by the shovel or cultivator. Care should be taken to leave the land level, for level culture is generally the best. When the plants begin to blossom, select the best for seed. One hundred plants will furnish abundant supply of seeds for a crop of 40,000 pounds. All the others should be topped before they blossom—indeed, as soon as the blossom is fairly formed. It should be topped down to the leaves that are six inches long, if early in the season; but if late, top still lower. If the season is favorable, in two or three weeks after a plant is topped it will be fit for cutting; yet it will not suffer by standing longer in the field. The suckers are now to be pulled off, and the ground leaves saved. The suckers ought to be pulled off before they get two inches long, as they spring out abundantly from each leaf where it joins the stalk. Ground leaves are those at the bottom of the stalk, which become dry, and should be gathered early in the morning, when they will not crumble.

The worms ought to be destroyed as fast as they appear, or they will destroy the crop. Turkeys are the greatest help in this warfare that the planter can get.

CUTTING AND CURING.

When the plant begins to yellow it is time to put it in the house. It is cut off close to the ground, by turning up the bottom leaves and striking with a tobacco-knife, formed of an old scythe—such knives as are often used in cutting down corn. The plants should lie on the ground for a short time, to fall or wilt, and then be taken up and placed in small heaps of eight or ten plants, to be removed in a cart or wagon to the tobacco-house, or to be speared in the field, and then carried on the sticks to the house. There are various modes of securing it in the house—by pegging, splitting, tying with twine, and spearing, the latter now being considered the best and most expeditious method. Tobacco sticks are small, round and straight, 4½ to 5½ feet long. They may be rived out like lath or narrow paling, 1 to 1½ inch square, smaller at one end than the other. One end is sharpened to admit the spear. The spear is round, or like the Indian dart in form. It is made of iron or steel, bright and sharp. These sticks are carried to the field, and dropped one at each heap of newly cut tobacco. The spearing is done by jobbing one end of the stick into the soft ground, the spear being on the other end, and with both hands running the plant over the spear and down the stick, thus stringing the 8 or 10 plants in the heap on the stick. It is then laid in piles, or placed at once on the wagon to be taken to the house, and handed up to the person who hangs the sticks across the joists or beams, placing them 12 or 15 inches apart, and smoothing the leaves down so as not to let them crumple in the curing, and adjusting the plants on each stick, that one shall not touch the other. As the tobacco cures the sticks may be pushed closer together, to make room for more tobacco and to exclude damp air from

the cured tobacco. The tobacco houses should have many doors and windows, so as to admit light and dry air, and, by closing them in bad weather, to exclude the rain and dampness, which materially damage the tobacco, besides injuring the color of it. But a better plan for such as can afford it, and all can who grow large crops, is to have the house perfectly tight when the doors are closed, and to hang the tobacco plants rather further apart, and cure it with Messrs. Bibb & Company's patent tobacco "firing and curing apparatus."

This apparatus is not costly, and will pay for itself by the increased value of ten hogsheads, or, in some cases, five hogsheads. Ripe tobacco cured by it is admitted to be worth in the market twice as much as if air-cured. It is highly recommended by all who have used it. It saves the expense of large barns by effectually curing the tobacco in a few days, when it can be taken down and removed to convenient sheds or pushed to the outer sides of the house, and stowed as close as possible without danger, for it is thoroughly dried, and the house can be again filled; and thus the curing of the crop goes on until all is secured. With this apparatus the dried tobacco can be brought into the proper state for shipping and preparing for market at any time, by means of the warm vapor it produces when arranged for the purpose. Any person of ordinary intelligence can manage it. So safe is it from danger of fire that many careful planters use it without fear in houses surrounded by wheat and haystacks.

After tobacco has been cured and is dry, whenever the weather is mild and damp it will become soft and pliant, and then may be stripped. It is first taken off the sticks and laid in heaps, and then the leaves are stripped from the stalks and tied in bundles of about one-fifth or sixth of a pound each. The bundle is formed by wrapping a leaf around the upper part of a handful of leaves, for three or four inches, and tucking the end into the middle of the bundle. There should be, if the quality of the crop permits, four sorts of tobacco, second, bright, yellow, and dull. When the tobacco is taken down the cullers take each plant and pull off all defective, trashy, ground, and worm-eaten leaves next to the big end of the stalk, and then throw it to the next person, who takes off all the best bright leaves (and if there be any yellow leaves he lays them one side, until he has got enough to make a bundle) and throws the plant to the next, who takes off all the rest, being the dull; and the respective strippers, as they get enough leaves in hand, tie up the bundles, and throw them apart to keep the sorts separate for convenience in bulking. Stripping should not be done in dry, harsh weather. It is best not to take down more than can be tied up in a few hours. To bulk tobacco requires judgment and neatness. Logs should be laid parallel with sticks or boards across to support the bulk, and allow free passage for air under the bottom.

The bundles are then taken, one at a time, smoothed and spread out. This is most conveniently done by putting them against the breast and stroking the leaves downward, smooth and straight, with the hand. They are then passed, two bundles at a time, to the man bulking. He lays them down, two at a time, in a straight row, and presses with his hands; the broad part of the bundles slightly projecting over the next two. Two rows of bundles are put in a bulk, and both carried on together; the heads being the outside, and the tails touching or barely lapping. The bulk, when carried up to a sufficient height, ought to have a few sticks laid on the top to keep it in place. It must now be often examined, and if it gets warm or has a musty, bad smell, it will require to be changed into another bulk, laying it down one bundle at a time without pressing, so that it may lie loose and open to admit free circulation of air. This is called wind-rowing. After it has become thoroughly dry and has a strong smell it is fit to "condition;" that is, when the moisture or warmth of weather makes it pliant, it is bulked in three or four, or even six-rowed bulks, and covered with boards or sticks and weighted down with logs, &c., when it will keep in nice order for packing in hogsheads at any time. The best time to pack is during

mild, pleasant weather of spring, or in summer. The best tobacco prize is one known as Page's prize. It is cheap, expeditious in its working, and, being easily taken down and put up, may with convenience be moved from house to house.

THE OLD SYSTEM OF GROWING TOBACCO.

In the days of slavery, tobacco, like king cotton, was grown on too large a scale, and consequently did not pay per acre what it ought by half, and impoverished the lands where it was grown. Now, things have wonderfully changed, and planters cannot afford to pay high prices for the unstable labor of migratory freedmen and grow tobacco on a large scale. Again, when grown extensively by one planter, as formerly, he cannot compete in the market with the small crops, nicely handled, of the thousands of farmers who are for the first time growers of tobacco. Another reason is, common tobacco will not sell now-a-days. Nothing but good, fair tobacco, with fine wrappers, will sell, and that brings high prices. It is clear, then, that the best policy for growers is to try to make no more than they can make and take care of, so as to command a good living price. With industry and a favorable season, and good soil, as many as 7,000 or 8,000 pounds of tobacco have been made by each hand, little and big, besides the other usual grain crops on a farm; but being made on all sorts of land, and air-cured, rammed into houses forced to hold double their proper capacity, the tobacco allowed to make as great a growth as possible, looking to weight more than quality, and carelessly managed from beginning to end, it brought in the market an average price of $3 per 100 pounds. This would be $240 per hand for the very extraordinary crop of 8,000 pounds. This was bad management then, when labor cost nothing but food and clothing, and yet that expense was repaid with enormous interest in the increased value that very labor was acquiring for its owner. But now, when so high a price must be paid for labor, such a practice is ruinous. Under the present state of affairs but one course is left for the grower of tobacco, and if he follows it I am sure he will reap a full reward. I venture to suggest a system.

THE NEW SYSTEM OF GROWING TOBACCO.

In the beginning I would say, unless his land is a good tobacco soil naturally, let no man attempt at this day to grow the plant, for if he does he must fail to make a living profit from his labor. If the soil is light, alluvial, clover-producing, and too light for heavy crops of wheat, let it be well ploughed in the spring and, unless very rich, fertilized so as to hasten the growth of the plant; work it well, after planting no more than can be managed well by faithful and reliable laborers on the farm during all its stages from planting to packing; keep it clear of worms; top early and top low; house when ripe; cure with the tobacco-curing apparatus; assort and manage neatly, and send to market in nice order. This being done there will probably be an average of 800 pounds to the acre, worth from $20 to $30 per 100 pounds, or $160 to $240 per acre. Allowing three acres to each hand you have an income of $480 to $720 per hand, and only three acres of land employed, while on the old system eight acres were used, and only $240 made. These estimates are low, for there are many instances in the lower counties of Maryland where much larger returns have been realized by pursuing this system, which I do not claim as original, but the result of the actual experience of practical planters, who did not stop to lament during the transition state of labor, but boldly met the tide of impending ruin, and started out upon a new system, employing with pleasure all the substitutes for labor, offered by labor-saving machinery and new inventions, to aid the skill and furnish hands to the husbandman; and they have been well compensated for their hopeful enterprise.

In consideration of the great number of persons who have lately engaged in the growing of this crop on a small scale this essay has been prepared, with a view to facilitate their work. The writer has studied to be plain, practical, and as concise as possible, in order to be perfectly understood. He hopes he has succeeded, and that his effort may conduce to the success of the tobacco planters of the Union.

EXPERIMENTS IN LIQUID MANURING.

BY WILLIAM S. RAND, OF CONCORD, KENTUCKY.

In 1858 my attention was drawn to the well-known fact, that at the foot of hills the earth was always rich and productive. This simple fact convinced me that the fertilizing properties, accumulating so regularly, washed from the hill sides; and that it was reasonable for manures to be transported through liquids. My conclusion then was that all the fertilizing qualities of manures must be reduced to liquids, before they can be absorbed by the growing plants. By decomposing the rough manures the necessary gases are evolved, whereby all vegetation exists.

Another effect of liquid manure upon the soil is that in whatever direction the liquid wastes run there you will find thriving the tenderest and most delicate of plants. Then if this washing from manure heaps will penetrate the minute fibres of the smallest vegetation, would it not supply larger and hardier plants with corresponding increase? These reflections induced me to put some of my convictions into practical use, which has resulted in success.

The first experiment failed by applying too strong a liquid to hot-house plants, which somewhat shook my faith. So, in the spring of 1858 I erected two large structures like lye-hoppers, holding a wagon load each, and so arranged as to lead the drippings off into a barrel sunk in the ground. Into one of these hoppers I put fresh stable manure, and turned rain water off one side of the house upon it. The liquor was offensive and destructive to young, tender growth, but nourishing and effective if applied to the ground previous to tilling.

The next experiment was leaching all the waste soapsuds, slops and dish water through fresh barn-yard manure, which was attended with inconvenience, but resulted most favorably as an experiment. In February, 1858, it was used without reserve on flowers, under cover and exposed. In the hot-house built underground, and covered with glass roof, it revived and nourished all the flowers, plants, &c., and increased the temperature to such a degree that vegetation seemed to grow by magic. A change from the use of liquid manure to tepid rain-water was apparent in a few hours. The soapsuds leeching was increased with the addition of wood ashes in proportion to one bushel of fresh wood ashes to ten of stable manure. This alkali had the strengthening effect of maturing the woody parts of vegetation and diminishing the vine-growing plants. Having a dairy in operation, the cow-droppings were conveyed to the hopper and converted into liquid manure; leeching soapsuds through a peck of fresh hen manure to five bushels of cow droppings. This yielded a liquid that had a most vigorous effect upon all vine-growing plants, and a contrary result upon the fruit-bearing department of our limited vineyard.

These observations convinced me that, on the theory that like begets like, it was necessary to know the component parts of all vegetation in order to feed

the various plants with what nature designed for their support. I saw in making these experiments that what would enrich one plant would impoverish another; so my object was to produce a liquid composition that would embrace all the parts necessary for the fruitful growth of vegetation. About this time the newspapers were describing the newly discovered Peruvian guano, and its beneficial effects upon all the vegetable kingdom. I was not long in securing the wonder of the age, and made fair and thorough applications. The result went to show that Peruvian guano is a good manure and is indispensable in some soils; but it is of no particular advantage on strong limestone sections; and that the proper application of the liquid manure will excel Peruvian guano in early growth and vigorous development. Besides, liquid manures are always months in advance of the raw material, ready to be absorbed, while the raw material is undergoing decomposition. Many manures and manufactured fertilizers have attracted the attention of farmers, but the daily wastes of their households are cheaper and more convenient, if not superior.

The materials undergoing experiment in the second hopper varied in substance and effect. Lime, rotten wood, decayed vegetation, refuse meats, old bones, iron, ashes, leather, slops, indeed everything perishable in and around a farm, found its way into this pile, and boiling hot water was poured over as occasion required. The application of this compound was poisonous to vegetation, except corn and potatoes. This liquid, however, was not so successful, and the contents of both hoppers were run into one hogshead. This proved the crowning experiment, and from season to season the hopper was filled with the most varied and promiscuous mass of decaying vegetation and animal matter that could be collected, care being taken that no one of the articles should exceed in quantity, but that the parts should be as nearly equal as possible, reserving for the top course lime, ashes and sand, thereby keeping the fermentation beneath the surface, and placing in the liquor a bag of charcoal to deodorize it.

Having acquired what was deemed and proved a great success, rotten compost and barnyard manure was well worked in one portion; another space of equal size was prepared for phosphates, patent fertilizer, &c., and worked up according to the manufacturers' printed directions; and the third space was turned up and thoroughly saturated with the combined liquid manure. The same crop, onion sets, was put out in each bed, and the result was, that the soil prepared with the liquid manure was so productive that the onions were eaten in the spring before the remainder reached a size fit for table use. The barnyard manure was second, and the fertilizer slow but producing a safe crop. Parsnips, beets, and cabbage were alike tested, with similar results.

This experiment demonstrated that manures can be reduced into fluid extracts, easily prepared, at small expense, ready for instant application to the farmers' crops, to be at once appropriated by vegetation. The plant can thus accept the substance, brought in abundance to its many mouths. There was but one dry fertilizer that held a respectable comparison with the liquid manure, and that was equal parts of rotten chip manure, hen droppings, and sand, mixed and applied as soon as the ground would bear cultivating. This compound is far ahead of any of the manufactured fertilizers offered in the market; indeed, you can take most of these manures, liquify them, apply the liquid at the same time you do the dry material, and the advantages will be a hundred per cent. in favor of the liquid manure. These observations are made from memory, otherwise the exact differences would be given in detail.

In the view of the writer, the best evidences exist of the success and advantages of liquid manures over composts and raw fertilizers. The growth of garden seeds sent by Commissioner Capron is a fair test and example. Two beds, each 4 feet wide and 20 feet long, were prepared in March, one with the best of dry compost, and the other with the liquid from the same compost poured over the soil. Equal portions of Simpson's early lettuce were placed in each

bed; one is now ready for use, the other just appearing. Carter's first-crop peas were given a favorable trial—half in the compost manure bed, and the residue in the liquid manure bed; the peas in the latter are five inches high, the others not up. Of Wood's early frame radish, the liquid manured will be ready for use in a few days, while the compost manured are weak, and doubtless their inquisitive roots are feeling around some lump of dry compost for life and substance, while the liquid is fed to the hungry plant and absorbed. The new Madeira onion is up and growing finely, while the seed in the compost is awaiting the action of rain and sunshine to supply its wants. These tests were made under very limited circumstances, and on garden products only.

If liquid manures are to be applied on a large scale, farmers interested must invent the apparatus for reducing manures to a liquid state. A cheap and simple apparatus is a common lye vat or hopper. Fill with two bushels new stable manure, a half bushel hen droppings, one peck of lime, one peck of sand, half a bushel of new ashes; then set the hopper to running by pouring over the whole, hot or cold slops, soapsuds, chamber lye, and the refuse liquids of the household. In a week or two stir the compost, and run the liquor through again. After extracting (as you may think) all the virtues of the contents, the latter may be used for mixture with other compost, or applied immediately as a fertilizer, and will prove equal if not superior to most advertised fertilizers.

HOW TO APPLY LIQUID MANURE.

If very strong, mix with earth previous to planting seed, two to three gallons to the square yard. When vegetation is up make the application near and around the plants at evening, or any time after rain, which is the safest way. The manure can be used until the plants bear fruit. Once in 48 hours is often enough.

The German proprietor of eight acres, referred to by Morris in "Ten Acres Enough," who transformed the neglected farm of a drunkard owner into a garden of immense productiveness and great profit, furnishes an example of an inexpensive style of tank, made by sinking a brick cistern in the barnyard, into which the liquid manure from six cows and two horses was conducted, as well as the wash from the pig pen and barnyard. The manure heap was always under cover, and kept thoroughly saturated by means of a pump in the cistern, which was also used for filling a hogshead placed upon wheels, and used for distributing the fertilizing liquid. The German started with a capital of three dollars, paid in labor for four pigs, and from these and the refuse of the family made, in a buried hogshead, sufficient liquid manure, applied by means of a wheelbarrow, to fertilize his acres, obtain more stock, and grow crops enough in four years to pay $600 for the place, support his family, and gather around him many household comforts and farm implements and appliances.

Mr. Morris, acting upon the suggestion of the thriving German, built in his own barnyard a tank, into which was conducted the wash from stable, pig pen, and yard. Once or twice per week this was pumped up and distributed over the manure heap, and over a huge pile of leaves, the whole mass being saturated with liquid manure, and never allowed to become dry. In the spring both heaps were found to be reduced to a half fluid mass. The effects of this manure were marked, bringing early vegetables to market 10 days sooner than those of neighboring gardens, and the fall crops enjoyed a still greater advantage from the longer continuance of the manuring.

I will conclude with the request that farmers try the experiment of liquid manuring, and satisfy themselves of its superior utility.

FARM EXPERIMENTS.

By W. H. Farquhar, Sandy Spring, Maryland

It is proposed to show the importance of farm experiments, to point out the imperfect manner in which they are generally made, and the consequent uncertainty of the results, and to suggest some practical considerations that must be taken into account in order to render them reliable, and to obtain the valuable fruits they should be made to yield.

Of all classes of men farmers are, perhaps, the most devoted to the empirical method of drawing conclusions; they are the most inclined to rely on the results of experience; to insist on seeing them with their own eyes, and to reject what they term theory. This being a marked feature of their character, it might be supposed a work of supererogation to press upon their minds the subject of the present article. Teach a farmer the importance of making experiments in his operations! He don't believe in anything else! He and his forefathers have been at it all their lives. Still it is a fact well known to all intelligent men in the profession, that this way of making experiments has been pursued from year to year, and from age to age, without arriving at decisive conclusions, at all proportional in value and number to the vastness of the field from which they are drawn. Some of the most simple and important questions, of the most frequent recurrence in practice, are answered differently by those engaged in dealing with them continually, while the modes of operation pursued are directly opposite. The experience of one farmer on certain points is just the reverse of his neighbor's—the results of one year's trial are frequently contradicted the next season.

I am aware that part of these discrepancies is owing to the infinite variety of circumstances which surround the man engaged in agricultural pursuits. Some illusion must ever be inseparable from a limited view of an illimitable field. It is not probable that the practical farmer will ever be able to attain the precision and certainty which characterize the chemist's work. The field of the one cannot be contracted into the laboratory of the other. But it seems reasonable to suppose that a considerably greater degree of certainty is attainable in the common and simple operations which employ the farmer during every season.

For the purpose of illustrating my subject I introduce a table showing the results of some experiments made last year, with a view to determine an important and unsettled question in regard to the proper seed to be used in planting potatoes. The experiment was made under the direction of the "Farmers' Club" of Sandy Spring, Maryland, and was carried through with due attention to those requisites for precision which are essential to obtaining results of real value. It was the design to have the experiment performed by a considerable number of persons, so that their conclusions, if generally coincident, might carry weight as a guide to future operations. Unfortunately, careful returns were made by four men only, as will be seen below.

The manner of the experiment was this: Nine rows, each four rods in length, and three feet distant from each other, were planted with the several preparations of seed mentioned in the table, the sets being placed 15 inches apart. The soil was similar, the same manures used in each row, and all were planted at the same time. The seed and product were carefully weighed.

Table of experiments.

	Experiments.								Average of experiments.		Increase over and above the seed, per acre.
	No. 1.		No. 2.		No. 3.		No. 4.				
	Pounds planted.	Pounds dug.	Pounds planted.	Pounds dug.	Pounds planted.	Pounds dug.	Pounds planted.	Pounds dug.	Pounds planted.	Pounds dug.	
Whole:											*Bush'ls.*
Large potatoes.....	11	55½	25	61	10	96	18	84	16	74	226
Medium potatoes ..	4½	44	9	40	5	80	7	38	6¼	50½	172
Small potatoes.....	1	32	4	22	1¼	58	2¼	47	2 3-16	39¾	146
Cut to two eyes:											
Large potatoes.....	1¼	29	3	22	1½	64	2¾	49½	2⅛	41	151
Medium potatoes...	1¼	21	2½	23	1	58	1½	41	1 9-16	35¾	133
Small potatoes.....	⅞	14	1½	18	½	42	⅞	26	15-16	25	94
Cut to one eye:											
Large potatoes.....	1	24½	2	26	¾	54	1¼	36½	1¼	35¼	132
Medium potatoes...	¾	19½	1½	19	¾	41	1	26½	1	26½	99
Small potatoes.....	½	16	1	13	½	35	½	19½	⅝	21	79

I do not presume to say that the conclusions to be drawn from the foregoing table have any claim to be considered decisive. The number of experiments was too limited. Only one sort of potato, the Buckeye, was used. The yield in each case was quite moderate, and the trial was only for one season.

The results, so far as they go, however, are certainly very striking; they are suggestive, though not decisive, and appear to me well deserving of consideration and careful repetition. The experiments were made in the only way in which reliable conclusions can be obtained—that is, by *accurate weighing* and *measuring*, and the results coincide in a manner quite remarkable.

We find that large potatoes, planted whole, yielded an increase nearly three times as great as small potatoes cut to one eye, while there is a tolerably uniform and regular decrease in the product, in proportion as the size of the seed is diminished, and as it is cut into smaller pieces.

Repeating the disclaimer that the results as obtained above ought not to be taken as decisive of the kind of seed which the growers of this most important root should use, I think it not unreasonable to urge that they furnish striking evidence of the importance of making a number of systematic experiments, in order that this particular question may be settled. The conclusions from the foregoing table may be quite erroneous; but if they are true, it is easy to see the immense loss which the country yearly sustains from the prevalent want of correct information on the subject. Let us suppose, merely by way of illustration, that a sufficient number of trials had been made, in different soils, and for different seasons, and that all the results led to conclusions similar to those obtained by the four persons whose experiments are given above. I think that a greater number of farmers plant small potatoes than large ones; but we will suppose that the diversity in this respect is such that they use an equal number of the several sorts of seed mentioned in the table. Striking an average in this way, we find the result would show a mean increase of 136 bushels per acre, or 90 bushels less than where large potatoes planted whole were used. In other words, by the ordinary custom of planting, without paying particular attention to the size of the seed potatoes, or to the number of eyes left in the set, there accrues (by my estimate) an annual loss of 90 bushels per acre, as compared with the crop that would be obtained by employing the most favorable conditions in regard to seed.

According to the tables prepared the present year in the Agricultural Department, there were 1,067,484 acres planted in potatoes in 32 States of our Union in the year 1867, with a product of 86,700,000 bushels, or about 80 bushels to the acre. Now, if we assume the loss, from the cause alluded to, as one-half what it appears to be, we should have a deficit of nearly 50,000,000 bushels. Just about this time 50,000,000 bushels of potatoes would be a very acceptable addition to the stock of that indispensable article of food.

The above estimates, though fairly deducible from the limited data, are doubtless extravagant; and are brought in, as I trust will be readily understood, not so much for their value in supplying material for precise calculation, as to show, in an impressive manner, the vital importance to the farmer of settling this and many similar questions by a full course of reliable experiments. Such an end is surely attainable. The laws of nature are invariable and inexorable, and man is permitted, by using the proper means, to discover all knowledge necessary for his guidance. Why is it that we are still so much in the dark regarding some of the simplest questions that start up in our path every returning season? It appears to me that such an unsatisfactory condition of things is owing to the aversion of most farmers to trying any course that might move them out of the old ruts, to their reluctance to make experiments which would interfere with their regular operations, and to the loose and indefinite mode pursued in performing the experiments they do undertake. Two things are absolutely essential to establish conclusions on which we may wholly rely. The experiments must be numerous, and frequently repeated; and precision must be secured by the careful use of weights and measures throughout the process. To illustrate still further the principles set forth in this essay, and show their practical workings, I will give some details, drawn from the experience of over 20 years, of a small association of farmers residing in the interior of the State of Maryland. There is sufficient community of feeling among men engaged in this profession to give a general interest to matters in themselves merely local, and the long continued experience of a few plain farmers in one section of the country cannot be without some value to their brethren in other places.

In the early part of the year 1844 a few persons in the neighborhood to which I refer conceived the idea of a social farmers' club, which was immediately organized on very simple principles. It was agreed to meet in the afternoon once in every month, at each other's houses, to inspect the condition and operations of the farms, (which were of quite moderate size,) to discuss, or rather hold familiar conversation upon agricultural questions, and to enjoy a pleasant social evening. The only rules adopted were stated to be "such as should govern gentlemen in associating together." Perhaps the single peculiar feature consisted in calling on each member for a question, which should be answered in such way as to call out the views of every one present (it being well understood that the most valuable suggestions are often drawn from those who are least forward in expressing them.) The meetings of this club have been held regularly for 24 years with undiminished interest. A record of the proceedings has been kept from the commencement, some portions of which, appropriate to the present purpose, are now extracted from the old books in which they have been quietly resting so long. The origin of the club dates back (partly perhaps as effect, and partly as cause) to that period when the renovation of worn-out lands commenced in earnest in this part of the country; that noted revival in agriculture, to which the writings and practical experiments of the present chief of the Agricultural Department (then residing but a short distance from the seat of our club) largely contributed. It will afford some evidence of the nature and amount of this improvement to present a statement of the crops raised by the members of the club during the first years of its existence, as compared with those of the last two or three years. As the number of members has varied at different times, (from 12 to 16,) it will correctly convey the information designed, to give the

amount raised in one year, per member, of a few leading productions, taking an average of the whole club. For 1844 and 1845, (mean of the two years,) each member raised 118 bushels of wheat on 9 acres; 265 bushels of corn on 11½ acres; 205 bushels of oats on 12 acres; 56 bushels of potatoes on one acre; 11 tons of hay on 15 acres, and 1,727 pounds of pork; total value, $700.

In a similar manner, an average of the years 1866 and 1867 shows a product from the same farmers, (except in three cases, where the son succeeded the father,) per each member, of 234 bushels wheat on 17 acres; 690 bushels of corn on 17 acres; 363 bushels of oats on 12½ acres; 690 bushels of potatoes on 6¼ acres; 44 tons of hay on 28 acres, and 2,500 pounds of pork; total value over $3,000.

The increase is, on wheat, 100 per cent.; (of late years the wheat crop has been falling off; in 1852 and 1853 the club raised over 500 bushels per member;) corn, 160 percent.; oats, 77 per cent.; potatoes, eleven-fold, and hay four-fold.

The foregoing statement will give an idea of the improvement in the poor lands of this part of the State, which in point of natural fertility are a fair sample of the soil of Montgomery county.

The means of renovation chiefly looked to at the commencement of the period spoken of was the use of lime. At the time, or soon thereafter, nineteen lime-kilns might have been counted within the limits of the neighborhood, which were supplied with stone hauled a distance of three to ten miles, from quarries in the adjoining counties. I observe in early records of the club such entries as these:

> The use of lime on this farm has evidently produced the most beneficial effect wherever applied; and great encouragement is held out to persevere in the use of it.

On another farm:

> The effects of lime on the corn crop were pointed out, and the decided superiority, where it was allowed to remain on the sod for two years, over any other application of lime was admitted.

In another case:

> Lime thrown upon the sod some months ago, and left there, had produced a very evident effect.

Again:

> We could see evidences of great improvement that lime had effected, and were told of an experiment under way, of ploughing in green crops together with successive dressings of lime, of more of which we shall be glad to hear in the future.

I do not find any subsequent report of this experiment, thus referred to in December of the year 1844. A new fertilizer now appeared in the field, which was destined soon to absorb the interest of our farmers, and put a stop to the use of lime. In less than two years after the last reference I find recorded in the minutes of our visit to the same farm this disparaging entry:

> Several large lime heaps showed themselves in the corn-field, suggesting the inquiry, why they had not been spread? Answer not satisfactory.

Testifying, in fact, the indifference now felt toward the old, once-admired fertilizer. To show the consequences that followed this giving up of lime for the new agents, guano and bone, I make one more quotation from the proceedings of December, 1855:

> We were shown the foundation of a tenant's house—tenants of cottages on our own places being now the only farm hands that we can depend on. The improvements on this farm, in its buildings, fruit and ornamental trees, its crops, as well as the quality of the soil, in so short a time, (mainly attributable to the great virtues of guano,) is very remarkable; and it is believed by your secretary that the same amount of improvement could not have been obtained by any other agent, not even by that premium fertilizer, lime, in ten times the period.

The land had been bought for $2 05 per acre in 1840; now worth $80. And though the use of lime was continued a year or two longer, the most conservative of our members at length nearly or quite discontinued it. Of the 19 lime-kilns before spoken of, there may be one or two occasionally used, but in the case of the greater number, the stones of which they were built have gone into the foundation of new barns and other structures rendered necessary to

accommodate the increased productions resulting from the use of the modern fertilizers. All this has come about, not that we loved lime less, but that we loved bone and guano more. I believe there is only one of our club, and he a large and successful farmer, who considers his use of lime a positive injury.

The first notice of the wonder-working dust from Peru occurs in the record of the meeting held in September, 1844. On the farm of Mr. Kirk guano had been applied to 18 hills of corn, a spoonful to each hill after the corn was up; and the ears thus produced were exhibited, tied in a bundle, by the side of the product of other 18 hills, that had received no guano. The former weighed 19½ pounds, the latter 7¾ pounds. Here was an experiment of the sort to convince farmers. Our club, on the strength of it, bought thirty hundred weight that fall to apply to wheat. The result being highly satisfactory, the use of guano has been continued by us ever since, with the exception of a year or two during the war, when certain compounds containing it were substituted. Bone dust has always been freely employed; and to these two articles must be attributed the great improvement that has taken place in this section of the country.

Many extracts might be made from the old records of our club, which tell of things coming straight out from the farmer's heart, exhibiting his peculiar ideas, (crude and often inconsistent,) his practical observation, seasoned with genuine humor, sometimes superficial, but always of some value, along with the evidences these pages afford of steady progress; all calculated to inspire an interest in those engaged in the same great pursuit. But it is necessary to hasten to a brief relation of those proceedings which throw especial light upon the subject of the present article, "Experiments in Farming." While nothing is more certain than the fact that the association I am describing has produced considerable direct benefit in improving agriculture among us, and has indirectly exerted a still more beneficial influence in a social way, in enabling our farmers to overcome that isolation peculiar to the class, and accustoming them to work together for the common good—whence have sprung improved road laws, neighborhood turnpikes, lyceums, &c., &c.—there is still one important question to be asked. It is this: What great disputed points in agriculture have been settled by the experience of this particular association, extended as it has been for a period of 24 years? What principles have been thus established that will effectually serve to keep our children from repeating our early mistakes, and guide them into better ways? I look over the long files of our proceedings without being able to extract an answer altogether satisfactory. It is true that the introduction of the modern fertilizers was an experiment, and a very successful one; though by no means the sole work of our club. The propriety of hill-manuring for corn, and of covering it with a horse-fork instead of a hoe, (both of which were earnestly resisted by several of our most practical members,) is regarded as being settled by our experiments; the same is the case with a number of other minor matters which might be selected and shown. We have also shared in the general benefits diffused by the agricultural improvements of this progressive age. Still, the multitude of important questions remaining unsettled, the conflicting opinions in regard to the commonest details that crowd the pages of our old records, give evidence that we failed to accomplish many things which might have been effected by a well-digested and persevering series of annual experiments. In reviewing the records of the club, I made out a set of notes under the three heads of "Experiments," "Opinions" and "Facts." Of these three, the column containing "Opinions," filled up much the most rapidly; and it is quite amusing to notice the divergence, and the changes from year to year, forward and backward, in respect to different farming operations. A few brief extracts will suffice as a sample:

1847. "One-half the members present do not object to ploughing ground wet in the winter; the other half disapprove it decidedly." "Is it advisable to raise sheep on moderate sized farms?" Club equally divided. "Is it advisable to apply lime and guano together?" Decided that it is. "Should guano and plaster be used together?" Answer, "No."

1852. "What is the best way of using barnyard manure?" Answer. "Plough it under this fall for next spring's corn-crop." "Should it be left spread on the surface, or ploughed under directly?" Club equally divided. But in August of the next year "the majority favor hauling out manure on the sod now and leaving it spread to plow under in the spring for corn." On this important question the majority in favor of leaving barnyard manure spread on the surface increased from year to year, so that in 1859, "16 out of 17 farmers present prefer surface manuring."

In 1853 the club is reported as equally divided in regard to putting in wheat with the drill, or sowing it broadcast. Though wheat drills were early introduced among us, it happened that some experiments made to test the two methods showed, or seemed to show, an advantage for that sown broadcast. Whereupon our farmers too hastily gave up the drill for several years. Since the guano attachment was added the practice of using the drill has been resumed, and seems likely to become general.

1853. Majority against rounding roads in our clay soil.

The sentiment on this point has since changed.

September, 1852, decided it would be economical to apply 250 pounds of guano and 9 or 10 bushels of bone per acre of wheat. In August, 1854, 5 bushels bone per acre preferred for wheat. In 1855, majority favor the larger dressing.

It is fairly presumable that the opinions of farmers in this particular locality are not a whit more vague and conflicting than those of the great agricultural class in other parts of the country. I am sure the readers of the interesting report of proceedings of the American Institute Farmers' Club, as published in the Tribune, must be struck with the frequent evidences there exhibited of amusing inconsistencies and fanciful doctrines. I think farmers are a good deal alike, and the specimens above exhibited, with many similar ones that might be extracted from the proceedings of every farmers' club, may be regarded as a representative picture, showing that agriculture has its "uncertainties" as well as other professions. The important question is, what are the proper means of removing, or at least relieving, these uncertainties? The association which has been so often referred to gave the true answer to this question at an early period of its career. At a meeting held in October, 1846, the proposition was made and unanimously adopted that "each member should make a certain experiment in agriculture, of such sort and on such a scale as may be convenient, to be agreed upon at the regular meeting held at his house, the results to be reported at the next ensuing meeting held there." It is very much to be regretted that so excellent a plan was not vigorously executed, but suffered to fall gradually into disuse. And this neglect must be regarded as the one great omission in the history of the club.

Some interesting experiments were made in compliance with this rule of the association, but as the present article is already drawing to a greater length than was designed, I shall not occupy more space with details of results necessarily inconclusive for want of confirmation by persistent repetition.

There remains, however, one experiment made by two members of the club, so closely connected with the purpose for which this article is especially written that I cannot pass it over. It is well known that the analysis of soils came into fashion a few years ago, and for a time excited great expectations of the benefit it would be to the farmer. These expectations have not as yet been fulfilled. The results from analysis thus far obtained are so imperfect as to create doubts of its value in the minds of even many scientific men. A single experiment was tried, as before mentioned, with impressive results. A quantity of earth was taken from an old sedge field, long thrown out from cultivation, and as sterile as they have them in old Montgomery, and analyzed (in the laboratory of B. Hallowell) at the same time with an equal quantity of the richest soil belonging to the county. The usual earthy constituents, clay, silex, &c., were found in nearly equal proportions in both; next lime was tested for, and now the experimenters expected to observe a great difference, but the well-known white precipitate fell in both vials in nearly the same sufficient amount. But

when we came to try for the phosphates, the proper test exhibited a full proportion in the fertile soil, and none, or a mere trace, in the other. Of course the means of cure for the sterile soil was plain. Bone was applied, and the field has, for nearly 20 years, produced good crops of wheat, corn, clover, and timothy.

It appears to me a matter of positive certainty, whatever chemistry may have done or failed to do for agriculture in the past, that a wide field is open for it in the future. Great improvements are yet to be effected by its agency, but in order to realize them the chemist must become a practical farmer, and the farmer be an intelligent chemist. Were it only to teach the art of making experiments, the lessons of that science are invaluable, in fact, indispensable. And this remark brings me to the last, and, in my view, most important part of what I started out to say. Reflecting persons, who look attentively at the present condition of the country, must see that it is time something should be done to keep our young men from carrying their stout arms and (what is more important still) their lively minds into other pursuits. The drain that has long been going on, and never more rapidly than now, is most exhausting and fatal. In spite of all that has been said and sung by naturalist and poet in praise of the country, our youth "still crowd the road impatient for the town." They leave the place where they are sorely needed, and go where they are not wanted. Why is this? and must it continue so? Various causes are at work which influence the youthful mind: the fatal "haste to be rich," blinding their reason to the fact that good farming is now the surest road to solid wealth; the disgust for "hard work," driving them into scenes often found to be more painfully laborious than those they left; the desire for the vulgar excitement of a crowd overpowering the voices of nature that call them to a beauty, a wonder, an enjoyment more rational, pure and elevating than aught the tumult of cities can afford. To correct these false views of life, and of the higher purposes for which it was given, there needs the present application of direct antidotes. Above all things it is needed to make agricultural pursuits interesting to the young, so they will gladly take to them, and not stay in the country merely because they cannot get away. Now the one sure way to make anything interesting is to address directly the mind and heart. It is not enough to see that farming feeds the body; you must show that it possesses every attraction for the mind. But the intellect especially requires problems for its investigation, with some assurance of certain beneficial results. It requires, above all things, to be kept active. In no sphere in life can this end be more surely attained than in solving the innumerable problems that throng the farmer on every side, by means of experiments devised with intelligence and pursued with perseverance. This appears to present the most interesting and fruitful field of action which the busy world now offers to busy man.

IRRIGATION.

BY CHARLES D. POSTON, ARIZONA.

The attention of Congress was called to the subject of irrigation in Arizona several years ago, and $150,000 were granted for that purpose. Aided by that grant the first irrigating canal undertaken by our government is now progressing favorably under the direction of Colonel George W. Dent, superintendent of Indian affairs for that Territory. This measure was a necessity. In that country, without irrigation there can be no production, no life. With such a canal

the soil of the Colorado becomes wonderfully productive. The sun is very genial, and the valley being not more than 350 feet above the level of the sea, possesses an immunity from snows and frosts.

Nor is irrigation a new experiment. It existed in Egypt before the pyramids were reared; it was practiced in Asia before Confucius wrote; it was brought to great perfection by the Aztecs of America, when our ancestors in Europe were dressed in skins and furs and lived by the chase. It is scientific agriculture, and the only insurance against the uncertainties of a crop. With a proper system of irrigation you will surely reap where you sow, yea, even twice or thrice a year. There is no reason, then, why the valley of the Colorado may not be made as productive as the valley of the Nile. In that climate it only needs the vivifying influence of water to make the productions of nature spring up like magic. The sediment of the Colorado will plaster the walls of a canal and make them impervious to water. Such is the beautiful provision of nature. On this river a lively commerce is springing up, and some half dozen steamboats already plough its turbid waters. It is navigable 500 miles from its mouth, and drains the Great American Basin. So the Indians will have a ready market for their surplus productions at their very doors, and the friendly waters of the Colorado will bear them untaxed to market.

The amount of land that will be brought under cultivation is estimated at 75,000 acres, which will produce abundant subsistence for 10,000 Indians—a much more economical and humane policy than has generally characterized our Indian affairs.

The Pima and Maricopa Indians, at their villages on the Gila river, have a very prosperous community of some 12,000 souls, subsisting entirely upon the results of a well-established system of irrigation. They cultivate wheat, corn, barley, cotton, beans, peas, pumpkins, and other vegetables, are sure of abundant crops, live in a genial climate, and suffer none of the anxieties of nomadic tribes. They have no public debt and pay no taxes.

Near the Pima villages in Arizona, the former inhabitants had irrigating canals diverting the waters of the Gila to a vast plain, which is now an abandoned, desolate, sandy desert. In its midst stands a lonely monument of a perished race in the ruins of a large adobe building, which may have been used as a citadel, a granary, or a temple. Five stories yet remain in a tolerable state of preservation, but its remoteness from water renders it difficult of access; and, although its dim shadow may be seen from the highway, looming up like a grim sentinel of the desert, few travellers ever diverge from the pressing duties of life to visit this mysterious and melancholy monument of the past. The Pima Indians can give no account of this ruin, except the idle tradition that it was the "House of Montezuma."

At the junction of the Verde and Salinas, tributaries of the Gila, there is an older and larger canal, which can be traced about 40 miles. Its bed is 25 feet wide, and its banks are yet 10 feet high. In the vicinity are the ruins of two cities, and between them the remains of an ancient fortification, which, judging from its size, must have been intended for a place of refuge in time of war. The Spaniards visited these interesting ruins in 1542, and first made them known to the world in the narrative of Father Marco de Niza, and in Casteñada's account of the exploration of the Colorado by Coranado.

TEXAS.

The Rio Grande del Norte is of no practical utility for navigation, but affords an abundant supply of water for the irrigating canals which tap its channel from source to mouth. The entire valley of the Rio Grande, like the Colorado, depends upon irrigation for cultivation. The irrigating canal, or *acequia*, at El Paso del Norte, is the largest. It taps the river at the falls of the Rio Grande

near Hart's mills, some five miles above the city, and supplies the valley for a distance of 25 or 30 miles, producing subsistence for a population of 15,000 souls. The vineyards of El Paso are not surpassed in the delicious flavor of their grapes, and the cereals are produced in abundance. On the American side of the river irrigating canals are taken out at Dona Aña, Las Cruces, Franklin, Isleta, Socorro, and many other small towns and settlements.

In the southern part of Texas irrigation is practiced to a considerable extent, and the towns of San Antonio and New Braunfels are beautified by irrigating streams, trained to run through their streets, gardens, and houses.

UTAH.

The greatest success which irrigation has achieved in this country is in the Territory of Utah, where the skilled and patient industry of the Mormons has literally made "the desert to blossom as the rose."

In Great Salt Lake City the beautiful mountain streams are trained to run along the streets, nourishing shade-trees, and overflowing gardens and fields, blooming with vegetation.

The value of the agricultural production of Utah, by the system of irrigation, is estimated at $4,500,000 for the year 1866.

The estimated area of tillable land is 268,000 acres, which at a ratio of 640 inhabitants to the square mile of irrigated land, will give support to 402,000 persons from the proceeds of agriculture.

The amount of land at present cultivated by irrigation is 134,000 acres.

CALIFORNIA.

In California I found irrigating canals which had been opened under the supervision of the Jesuit missionaries by the labor of the natives. At every Catholic mission these canals stretch for miles over land that produced nothing until these vivifying streams were spread upon it.

The absorbing occupation of gold-seeking has temporarily retarded the development of the agricultural resources of California; but the time is not far distant when the "golden era" will pale before a correct system of irrigation, for which the soil, climate, and water of that State are admirably adapted.

The science of hydraulic engineering, which has been stimulated to its highest perfection in the mineral regions, will be turned into the more legitimate and permanent channels of agriculture. With the exhaustion of the gold-placers the ditch and flume will find a richer "placer" in the vineyards and fields of cereals and vegetables of her prolific valleys. The reservoir of water congealed by nature in the Coast Range and the Sierra Nevadas will be trained to permeate the parched valleys of the Sacramento and San Joaquin, vivifying the soil, and enriching the husbandman more than it has ever done the miner.

The only safety for agriculture in California is in the adoption of an enlarged system of irrigation; it is the only insurance against famine, or a sudden drain upon her golden treasury in some year when the rain may fail. The rain-fall in California is only 20 inches, while in the Atlantic States and Europe it is more than double that amount.

If it is true, as stated, that irrigation increases the production from one-fourth to one-third, besides the insurance of a harvest, then a large outlay would be justifiable in securing its benefits. The high price of labor at the present time would make the cost of constructing irrigating canals in California greater than in any other country; but, if water can be afforded in Italy for $1 per acre, it ought to be supplied in California for $2 50 per acre. But the immigration of the Chinese, those ancient masters of irrigating science, will soon cheapen this kind of labor, and the despised Asiatics will contribute more to the prosperity of California, in building up a great system of canal irrigation, than they have already done in aiding the construction of the Pacific railroad.

An instance is stated which occurred near Stockton, where irrigation applied to grass land paid the enterprising proprietors, in one season, more than forty times the cost of opening the canal.

MEXICO AND SOUTH AMERICA.

The Spaniards, to their astonishment, found aqueducts and irrigating canals brought to great perfection in Mexico. The gardens of the Aztecs were the agricultural wonders of the New World. The Spaniards, already familiar with the system of irrigation in Europe, extended it in Mexico in vast proportions; and the masonry of aqueducts, reservoirs, and irrigating canals, forms some of the greatest monuments which they have left as a heritage to Mexico.

In Peru and Chili, aqueducts and canals were found by the Spanish conquerors crossing the lowlands in every direction, spreading over the country like a vast net-work, diffusing fertility and beauty around them; whilst the very sides of the Andes were terraced with trenches for catching water and conducting it, in some instances, many leagues to a lower temperature and a more fertile soil.

ENGLAND.

In England irrigation has been mostly confined to meadow lands, as the moisture of the climate renders it unnecessary for the cultivation of arable lands. It is stated that 1,292,329 acres of meadow lands, or nearly one-half of the grass lands of England, are irrigated.

The beneficial results of irrigating meadow lands have demonstrated a wonderful pecuniary profit. An experiment in drainage and irrigation made by Lord Hatherton upon 89 acres of meadow lands in Staffordshire afforded a clear annual interest on the outlay of 37 per cent. In Somersetshire a tract of 30 acres was drained and irrigated for meadow land, causing an increase in the rental from 2 shillings to 25 shillings per acre.

IRRIGATION FROM CITIES.

In Edinburgh, the drainage-water from a large portion of the city spread on meadow land caused an advance in the rent from £5 to £30 per acre. The grass was sometimes cut seven times in a season. The saving to the city of Edinburgh from the drainage-water thus economized is estimated at £45,000 sterling per annum

The drainage from London is no longer allowed to pollute the Thames, and wash away into the sea. Immense hydraulic engines may be seen on the river, some ten miles below London bridge, pumping up the sewage of the great metropolis to be spread upon the lands of the surrounding country, enriching a district heretofore unproductive.

In approaching Paris your olfactory organs will apprise you that the ordure of the gay capital no longer follows the Seine to the sea, but is utilized and spread upon the vegetable gardens which are to regale your appetite in the brilliant cafés of the epicurean city. Irrigation with liquid manure, by hose and pipe, is practiced extensively in France.

Next to the introduction of fresh water into a city, the disposition of its waste and sewage, in respect to the sanitary condition of its population, and the enrichment of soil in its vicinity, is most important.

It is estimated that in a city of 100,000 inhabitants there is produced of human manure 24,440 tons per year, a quantity sufficient to fertilize 50,000 acres of land; and if conveyed to the soil by irrigation, would be worth at least $60,000 per annum.

The difference in cost of enriching soil in England is estimated as follows:

	£	s.	d.
With sewage water, per acre	0	12	0
With guano, per acre	1	0	0
With farm-yard manure, per acre	3	0	0

SPAIN.

Spain, at this day, employs irrigation to so great an extent that few crops are raised without it. One of the greatest specimens of hydraulic architecture is the dam and canal made by the Moors for leading the waters of the Guadalquivir into their beautiful capital of Granada. The dam was constructed between two steep mountains, for the purpose of collecting a reservoir of water. It is 156 feet high, 70 feet thick, and 273 feet long. The waters after irrigating the vineyards of Alicante, were conducted through the streets of Granada, and contributed to the wealth, beauty, and luxury of that gorgeous capital, in fountains, baths, fruits, and flowers.

One of the largest enterprises for opening an irrigating canal in Spain has recently been undertaken by Mr. James Eldredge, an American, who became familiar with the system in California. It is a concession from the Spanish government, and embraces the right to purchase, at a nominal cost, the body of land which the canal is intended to reclaim from sterility. The location of this enterprise is about sixty miles south of Madrid, and will involve an outlay of about $5,000,000. Success to the American irrigator in Spain!

ITALY.

Italy may be styled the classic land of irrigation. There the practice of hydraulic engineering is taught as a science, and rises to the dignity of a profession. The principal university where this science is taught is at Turin, in the vicinity of which city an extensive system of irrigation gives ample opportunity for practical education. In the reign of Theodoric I, a hydraulic engineer was brought from Africa to teach the manner of obtaining and regulating supplies of water from rivers.

The Romans gave preference to the irrigation of meadows, and Cato, the oldest Roman rustic writer, expressed his opinion that the way to become rich quickly was "by grazing cattle well." They cured hay twice a year, and cut it for forage four times.

The modern Italians have devoted their energies more to the irrigation of arable lands, and have by far the most perfect system of irrigation in Europe. The great canal of the Ticino, in Lombardy, was constructed in the 12th century, and has for more than 600 years carried a volume of water equal to 1,800 cubic feet per second. This great mass of water has been spread over the surface of the country through a thousand channels, stimulating the productiveness of the soil to such an extent as to make the country through which it passes one of the richest and most densely populated which the world has ever seen.

In Piedmont the irrigated region covers 1,500,000 acres, with a network of 1,200 miles of canal. The water-courses are fed from the melting snows of the Alps, and swell to their greatest volume in the hot, dry season, when the lands are most thirsty. The construction of these canals has engaged the attention of every government in Italy, including that of the Great Napoleon.

The charge for water is a state revenue, and yields an average of one dollar per acre for irrigating lands.

EGYPT.

Egypt, the ancient nursery of the arts, was also the mother of irrigation. History gives no more satisfactory account of its first introduction than of the

building of the pyramids, but it is stated that Sesostris greatly increased the number of canals, which must carry their origin back to a period of great antiquity, as he lived about 16 centuries before the Christian era.

We need only refer to sacred history to prove the advantages of a well-established system of irrigation. The Egyptian granaries, insured by irrigation, were overflowing with corn when their neighbors were famishing for bread. Their great public works stand as eternal proofs of their agricultural abundance. The fertilizing effects of the waters of the Nile, after its overflow, could not fail to teach a simple lesson to the Egyptians, who had only to imitate nature to secure the fertility of the soil lying beyond the reach of these inundations.

The remains of canals as capacious as the beds of rivers may be seen in that sand-desolated country, showing the gigantic efforts which have been made by its inhabitants to irrigate that portion of their country, upon which a drop of rain never falls to refresh its languishing vegetation.

INDIA.

The famine in British India induced the government to undertake the construction of a system of irrigating canals. The great Ganges canal, the principal of these works, is nearly 1,000 miles long, (including its branches,) and takes from the sacred river 8,000 cubic feet of water per second. This enterprise has received an ample reward in the civilization of the people, the improvement of their sanitary condition, and the immensely increased revenues of the government from land and water rents. The canal and its branches form an internal network of water-carriage for the production, stimulated by the enlightened enterprise which has brought 11,102,048 acres of waste and malarious land under subjugation and cultivation.

The cost of opening the canal is estimated at £1,500,000, and the pecuniary returns, after deducting expenses, yield a net revenue from the investment, of 23⅓ per cent. annually.

Irrigating canals, in addition to the practical utility of insuring abundant harvests, contribute to the ornamentation of a country by watering rows of shade and fruit trees. In India the law directs that "on both sides of the canal trees of every description, both for shade and blossom, be planted, so as to make it like the canal under the trees in Paradise, that the sweet flavor of rare fruits may reach the mouth of every one, and that from these luxuries a voice may go forth to travellers, calling them to rest in the cities where their every want will be supplied."

The water of the great Delhi canal, carried over the low country in an aqueduct of masonry, after passing a cut in the mountains 60 feet deep, flowed through the city, distributing itself in minor streams, supplying gardens, fountains, and mansions—filling the marble baths, and watering rich fruits and flowers.

CHINA.

We cannot afford to despise the teachings of the Chinese, a people who were far in advance of Europe in the invention of printing, of gunpowder, of the mariner's compass, and of vessels adapted to navigation. We may learn a lesson in agriculture from the patient and industrious laborers in this most primitive and important occupation of man; who have made a network of irrigating canals through their extensive and populous empire, for stimulating the soil, and bearing their productions to market. The Grand canal from Pekin to Canton is nearly a thousand miles in length, and bears a vast commerce upon its bosom, and this is only one in a thousand of the arteries of this interesting and prolific empire.

JAPAN.

Japan has been sealed to the outside world for so long a time that very little knowledge of her agricultural improvements has gone abroad. Professor Blake, of California, who was employed by the Japanese government some years ago to make a scientific investigation of her mineral resources, informs me that the art of irrigation has been brought to great perfection by the Japanese. It is, in general, a hilly country, and water is taken out of the ravines and spread upon the hillsides in all directions. The numberless little ravines which, by their narrowness and steepness, are unsuited to cultivation are brought into luxuriance by means of dams built across from one side to the other. The space thus enclosed is filled with deep, fine soil, and a series of terraces is formed, one above another, and over them the drainage of the ravine can be spread at will; the water from one terrace being allowed to escape to the next, and so on to the low lands. These little patches of land are said to be the most fertile and productive in Japan.

IRRIGATION SEDIMENT.

When we consider the amount of fertilizing sediment carried to the sea by the great rivers, it will be well to adopt some method to arrest the waste and distribute it upon the land.

The quantity of alluvial soil swept into the sea by the waters of the Ganges is a 200th part of its whole volume, or 2,509,056,000 solid feet per hour. The Nile deposits the 120th part of its whole volume, or 14,784,000 solid feet per hour. The Mississippi deposits 8,000,000 solid feet of sediment per hour, containing the richest fertilizing properties, and the smaller streams deposit in proportion to the alluvial bottoms which they drain. What a wealth of fertilization is here washed away, especially when they also carry away the sewage of large cities! Verily, we are an improvident people.

INSURANCE OF IRRIGATION.

In addition to the certainty of returns, the actual produce of irrigated lands exceeds that of unirrigated lands by one-fourth to one-third of a crop. In a genial climate the harvest is placed beyond the influence of seasons. A crop of corn in the spring and of cereals in the autumn is the usual rotation in America.

Irrigated land never becomes impoverished, but is continually enriched by the perpetual deposition of sediment. The question of health and morality has been satisfactorily demonstrated by the improvement and reclamation of the jungles of India, where vast populations have been brought from a condition of wretchedness, famine, and insubordination into a state of health, contentment, and prosperity, by the abundant crops secured by irrigation.

In Italy, where tables are kept, the ratio of increase of population in irrigated districts is 50 per cent. greater than in unirrigated districts. The fecundity of the Chinese may be attributed to their abundant supply of water.

The population of irrigated districts is estimated as follows per square mile:

In Piedmont	270 per square mile.
In Lombardy	391 " "
In India	576 " "

IRRIGATION LAWS.

In countries where irrigating canals are constructed by the state, the tolls on water are collected as a revenue, and as these enterprises are generally undertaken for the common good of a community, they must, of necessity, be done by the state, or under state authority by associated capital and labor, in the form

of corporations. The laws regulating irrigation are well defined in Italy and Spain, and the laws of the latter country have been generally extended to Spanish America, and are usually adopted in that part of our domain acquired from Mexico.

In pueblos, or communities where irrigating canals exist, a judge of the water is elected by the community. He has jurisdiction in all disputes relating to the gathering and distribution of the water through irrigating canals. Each proprietor is allotted a supply of water proportioned to the labor and capital contributed to its introduction, or the amount of land he has in cultivation. He must punctually take his turn when it comes, whether it be in the day or the night, as the water is flowing all the time and cannot be allowed to run to waste.

In India it is estimated that one cubic foot per second will irrigate 180 acres of land.

TRANSPORTATION BY CANAL

To construct a canal for commercial purposes where a railway is available is to fall behind, not to keep pace with, the spirit of the times; but it is equally true that irrigating canals will prove great auxiliaries to railroads, by furnishing products for transportation, and that navigable canals will gather the produce economically at convenient depots for railway transportation.

CAPITAL FOR IRRIGATING CANALS.

The capital necessary to construct irrigating canals can easily be obtained by conceding to corporations alternate sections of land along their course, and the collection of water rents will insure a handsome income upon the investment.

The same liberal policy which has stimulated the building of railroads in our western country may, with equal propriety and benefit, be extended to the irrigating canals, and the reclamation of sterile lands. It is accounted a worthy and beneficent undertaking "to make two blades of grass grow where only one grew before."

In the census of 1860 the area of improved land in the United States is set down at 163,110,720 acres, and the unimproved land at 244,101,818 acres, or, in other words, for every two acres of improved lands, we have three acres of unimproved lands.

The Rocky mountains contain an abundant supply of water for irrigating the plains at their base, and the opening of irrigating canals on our western plains will inaugurate a new era of agricultural prosperity in a region which has hitherto only furnished grass for the buffalo and hunting grounds for the Indian.

CHINA.

It is my intention in accompanying the embassy of the United States, at the head of which is Hon. J. Ross Browne, the recently appointed minister to China, to examine that vast and comprehensive net-work of irrigating canals and water-works which contribute so much to the riches and convenience of a people who place agriculture among the most honorable occupations of mankind. If the investigation of this subject meets the approbation of your Department, and I am honored with a commission for the purpose, it will be a pleasant duty to unfold to my countrymen a system which supports one-third of the population of the earth.

VALUE OF BIRDS ON THE FARM.

BY EDWARD A. SAMUELS, BOSTON, MASSACHUSETTS.

That our birds, as a class, are eminently beneficial on the farm is now very generally acknowledged. In some localities wholesome laws have been enacted and local efforts have been made for their encouragement and protection; but the old prejudice against many species, because a few have been detected in misdemeanors, is still too generally prevalent, and every effort should be made by writers and students in natural history to eradicate it.

I have said that this prejudice has been caused by the misdemeanors, real or fancied, of a few species. It is of these few species, and their nearly allied relatives, that I propose to speak in the present paper. None of our birds have caused greater controversy among horticulturists and farmers throughout the country than the common robin, and agricultural papers have contained long articles relative to its destructive or beneficial qualities, and the light that has been, or should have been, shed on its habits is great. But, unfortunately, little is practically known of the bird save that it eats cherries and other small fruits, and that it is a nuisance generally. I have had a fair opportunity during the past ten years of discovering what its relative good and bad qualities are, and from my own observations, and those of others—careful students and good observers—I have arrived at the conclusion that the robin as a species is vastly more beneficial than injurious on the farm, taking into consideration all the interests of rural economy.

I will at the outset frankly acknowledge that to small fruit growers the bird is very often a pest; that it has a love for ripe cherries and berries, and that it often takes more than a fair share to itself; but, admitting this injury, which occurs during a short season of the year only, what is the amount of harm done in comparison with the benefits the bird renders to the farm through the remainder of the year? My observations regarding the food of the robin have been made both by watching the bird in various seasons of different years and by examining the contents of stomachs of dead specimens killed in a variety of localities and seasons. I have also been assisted by students in different parts of the country, who have sent me many specimens, and have examined others, making full memoranda of the contents of the stomachs of the birds.*

Beginning with January and continuing through February, I find that in a few specimens which were killed in the middle, western, and New England States, the contents of the stomach consisted in nearly the following proportion: Of barberries, 2; seeds, 3; insects, 3; a few larvæ, 3; cedar berries, 4; or, in other words, mention is made of barberries twice where insects are spoken of three times, larvæ twice, cedar berries four times, &c. We can see that during these two months the food must necessarily have been meagre; and although a few insects were obtained, the greater part of the diet consisted of seeds and wild berries, which were of little value to the agriculturist; allowing reasonable margin, and supposing that a portion of the insects were beneficial, we may conclude

* Special acknowledgments are due for specimens and memoranda to D. D. Hughes, Marshall, Mich.; E. R. Maynard, Newtonville, Mass.; E. E. Perry, Volusia, Florida; L. E. Ricksecker, D. Sampson, and H. A. Purdee. In presenting memoranda of the food of the robin it will be most convenient, perhaps, to arrange them by months.

that through January and February the robin is, in consequence of the variety of its food, proportionately beneficial four units, (being four-fifths of its insect food,) while it is injurious one unit, (the amount of beneficial insects it possibly destroys,) and neutral nine units; or, in other words, during the 59 days in these two months it is beneficial five-fourteenths of the time, or about 21 days; injurious about $4\frac{1}{5}$ days, and neutral the remainder of the time. During March a larger number of birds were examined, and the following memoranda made of their food in about the stated proportions: Small insects and spiders, 5 parts, (or mentioned five times;) barberries and partridge berries, 4; seeds, 5; larvæ, (some canker worms and grubs,) 4; earth-worms, 2; with other substances, such as pieces of grass, pebbles and leaves. We can, therefore, from the above, safely conclude that in March the robin is beneficial by destroying insects and larvæ, eight units; injurious, (by destroying beneficial insects,) one unit; and neutral eleven units—or, beneficial eight-twentieths of the time, or about $12\frac{1}{2}$ days; injurious $1\frac{1}{2}$ days, and neutral the remainder of the month. In April I find in various memoranda from different sections that in almost all cases the food consists of earth-worms, 3 parts; larvæ, 2; caterpillars, 2; insects, 3; barberries and seeds, 3. Taking the larvæ and insects at six units, allowing one unit for the probable proportion of beneficial insects destroyed, and placing the earth-worms, berries and seeds in the list of neutrals, six units, we find that during April the bird is beneficial six-thirteenths of the time, or about 14 days, injurious $2\frac{1}{3}$ days, and neutral the remainder of the time.

In May, also, the robin subsists on earth-worms, larvæ, and insects; and I cannot find that its food then differs essentially from that in April, and we will consider it to be beneficial 14 days, injurious $2\frac{1}{3}$ days, and neutral the remainder of the month.

In June the bird is eminently beneficial. It is during this month that the young birds are reared, which require to be fed entirely upon animal food, such as soft larvæ and worms, and the parents are busy from "early dawn till dewy eve" in securing for their family a liberal diet. It will be remembered that the warmth of the sun has now become so great that earth-worms are driven below the surface of the ground for proper moisture, and are, consequently, beyond the reach of the robin. Cut-worms and other terrestrial larvæ furnish the principal supply, and the number destroyed by a single pair of robins during this month is immense. I have had several opportunities for noticing this fact.

Near the house in which I was residing, a pair of these birds had nested in an elm tree, and paid frequent visits to the lawn near by. They hunted their food in the manner peculiar to the species, hopping a few steps, then pausing to scan the ground, and discover the lurking places of the grubs, their food. The instinct with which they ascertained the presence of the larvæ was wonderful, and I never could detect the signs that guided them. In the midst of their hop or run they would stop instantly, or turn abruptly from their course, and, with a quick series of pecks or diggings with the beak, the dirt and grass was removed, and the worm seized and borne away to the young birds. On no occasion have I seen the robin remove the earth from its prey by scratching with its feet, although it often digs down to the depth of perhaps an inch with its beak. The pair alluded to above destroyed, by actual count, 24 and 27 grubs (cut-worms) in the lapse of an hour, and, on another occasion, 26 and 30 of the vermin in the same period. All these insects were fed to the young birds, and nothing else, the season being very dry, and earth-worms hard to obtain. On another occasion I watched a pair of these birds, and saw them in an hour's time bring to their family of four young over 40 cut-worms and smooth caterpillars, and, I think, a few, very few, earth-worms. The young were not half grown, but the parents were constantly employed in furnishing them with food. These facts may seem improbable, and I confess that I would, if not familiar with the habits of our birds, be almost inclined to doubt that the young birds have such tre-

mendous powers of digestion. But it must be remembered that the caterpillars and other larvæ are composed almost entirely of juices, and their digestion is comparatively a matter of little difficulty. Professor Treadwell, of Cambridge, Massachusetts, in an exceedingly interesting experiment in the rearing of two young robins, corroborates my own experience most fully. A brief account of his observations will not be without value here. When caught the two birds were quite young, their tail feathers being less than an inch in length, and the weight of each about 25 pennyweights, less than half the weight of the full grown birds. Both were plump and vigorous, and had evidently been recently turned out of the nest. He began feeding them with earth-worms, giving three to each bird the first night. The second day he gave them ten worms each, which they ate ravenously. Thinking this beyond what their parents could naturally supply them with, he limited them to this allowance. On the third day he gave them eight worms each in the forenoon, but in the afternoon he found one becoming feeble, and it soon lost its strength, refused food, and died. On opening it he found the crop, gizzard, and intestines entirely empty, and concluded, therefore, that it died from want of sufficient food, the effect of hunger being increased, perhaps, by the cold, as the thermometer was about 60°.

The other bird, still vigorous, he put in a warmer place and increased its food, giving it the third day 15 worms, on the fourth 24, on the fifth 25, on the sixth 30, and on the seventh 31 worms. They seemed insufficient, and the bird appeared to be losing plumpness and weight. He now began to weigh both the bird and its food. On the 15th day he tried a small quantity of raw meat, and, finding it readily eaten, increased it gradually, to the exclusion of worms. With it the bird ate a large quantity of earth and gravel, and drank freely after eating. By the table it appears that, though the food was increased to 40 worms, weighing 20 pennyweights, on the 11th day, the weight of the bird rather fell off, and it was not until the 14th day, when he ate 68 worms, or 34 pennyweights, that he began to increase. On this day the weight of the bird was 24 pennyweights; he therefore ate 41 per cent. more than his own weight in 12 hours, weighing after it 29 pennyweights, or 15 per cent. less than the food he had eaten in that time. The length of these worms, if laid end to end, would be about 14 feet, or ten times the length of the intestines. The question immediately presents itself, how is this immense amount of food required by the young birds supplied? Solely and entirely by the continued labor of the parents. Suppose a pair of old robins with the usual number of four young ones; these would require, according to the consumption of this bird, 250 worms, or their equivalent in insect or other food, daily. Suppose the parents to work ten hours, or 600 minutes, to procure this supply. This would be a worm to every $2\frac{2}{5}$ minutes; or each parent must procure a worm or its equivalent in less than five minutes during ten hours, in addition to the food required for its own support. After the thirty-second day the bird had obtained its full size. Its food had been weighed daily, and averaged 15 pennyweights, two or three earth-worms, and a small quantity of bread each day, the whole being equal to 18 pennyweights of meat, or 36 pennyweights of earth-worms.

We have seen that during the month of June the robin with its family subsists almost entirely upon insect food, which consists of larvæ and other soft grubs, but very few hard-shelled insects, such as beetles, &c., being killed, and but few seeds and berries being available. We can safely conclude, then, that the robin is beneficial eight-tenths of the time, or 24 days; injurious, 3 days.

In July the bird is most injurious. It is now that cherries and other small fruits are ripe, and the young birds are out of their nests, subsisting largely upon these, but also eating some insects. I find that in all localities the following memoranda are given of the bird's food: cherries, 4; worms, 2; berries, 2; that is, these articles of diet are mentioned in this proportion and progression; from which we see that the old birds, and young just out of the nest, feed largely upon small fruits

But it must be borne in mind that a second brood is most generally reared during this month, when, of course, the parents are as beneficial as during June, the young being, of necessity, fed upon insect food.

The parents, then, are beneficial to the extent of their destroying injurious insects for their second family, and the first family of young are injurious to the extent of subsisting almost entirely upon small fruits. It is well known that young birds when growing require a greater amount of food than those which have left the nest, and we may safely assume that the amount of injury done by the first family is fully balanced by the benefit rendered by the parents in rearing the second brood, so that if we accept the preceding memoranda for July, we shall at least be on the safe side, and be fair to the birds. We will, therefore, consider, for the sake of allowing a margin, that during July the robin is beneficial 3 units in 10, injurious 6 units, and neutral 1 unit; or is beneficial during the month 9 days, injurious 18 days, and neutral 4 days. It is, of course, hardly fair to put the amount of injury as being actual, for who among our fruit-growers is so mean as to deny the robin any of his fruit, notwithstanding the bird labors for him so earnestly through the greater portion of the year. I have often asked farmers who had large cherry orchards if the robin troubled them much. Their reply was that the birds generally took a large share, but if they didn't get it the fruit would rot on the trees. I remember last year of passing through a country in which, a very large crop of cherries being upon the trees, of course the robins were busy, but I noticed that for one robin in the trees there were two on a newly ploughed piece of ground. I stopped and asked the farmer upon whose land the trees stood if he had noticed that the robins were very troublesome. He replied that while his cherries were ripe, and the surface of the ground was dry, the robins fed upon the fruit. "But," said he, "I began to break up this piece of greensward yesterday, and it seems to me that all the robins in the country are flocking on it." "Do you think they prefer the worms and insects to the cherries?" I inquired. "Certainly," he replied, "and, if they didn't, I should not care, for I can't afford to take my hands off of haying and hoeing for the sake of marketing a few cherries. I take what I want and give my neighbors and the birds the same privilege; but I notice that half the crop will rot on the trees." It seems to me that the whole truth of the matter is, that when insect food is unavailable, the robins and other thrushes have, from necessity, to depend upon the small fruits for subsistence.

During August the robin feeds upon small fruits, and principally upon insects, larvæ, worms, and spiders. My notes show about the following proportions: insects, 3 parts; berries, 4; larvæ, 1; spiders, 1; seeds, 1; showing that it is beneficial about four-tenths, or about 12 days; injurious perhaps three-tenths, or 9 days; and neutral 10 days. In September and October wild cherries and other wild fruits and seeds furnish a large share of the subsistence of the bird; but grasshoppers and other insects are eaten in large numbers.

In a considerable number of specimens, the following memoranda are made: "September 4, grasshoppers;" "September 10, small insects and worms;" "September 16, large green worms, small insects, and a few seeds;" "September 16, large insects and a few stones of small fruits;" "September 25, whortleberries;" "October 23, stones and small insects;" "October 25, worms, spiders, and small beetles;" "October 28, insects and worms." From these notes we gather that the robin, during September and October, is, by feeding principally upon insects, beneficial at least 5 units, and by destroying beneficial insects and eating cultivated fruits, injurious perhaps 3 units, and neutral 2 units; or beneficial one-half the time or 30 days, injurious 18 days, and neutral 13 days. During November and December, at which period most of the birds have migrated to the southern States, the robins remaining in the north subsist principally upon seeds of various shrubs and barberries; and, as insects are few, the food of the bird may be considered as neutral in an economic point of view. In a great many mem-

oranda I find that barberries and partridge berries are always mentioned, but insects only once; and the greatest margin we can allow the bird would be, in these two months, 9 parts neutral, and 1 beneficial; or beneficial 6 days, and neutral 54 days.

In summing up the operations of the robin for the whole year we find that it is beneficial 142½ days, injurious 59½ days, and neutral 163 days. The good that it thus renders the interests of agriculture is certainly sufficient to entitle the bird to the consideration of the farmer at least, and when its services are weighed against the comparatively small injuries inflicted on a few small crops, the ill treatment that it too often receives ought to be regarded as shameful and outrageous.

It is hardly necessary here to speak of the services rendered by the sparrows and finches, whose young are reared on the larvæ of noxious insects, or of the warblers, those lively, interesting little birds that we meet in the most retired localities; or the vireos, those familiar little friends of ours; or the fly-catchers, all of which feed exclusively upon insect food. Neither is it necessary to dwell upon the merits of the swifts and swallows, and night-jars, (whippoorwills and night-hawks,) all of which are now recognized by intelligent farmers as being eminently beneficial, and about which there is no controversy. But there are two other families which are much disliked, and both are deserving of the farmer's best protection. These families are the woodpeckers and the cuckoos. Of the first of these groups, the best known to ruralists is the woodpecker, known as the sapsucker, and it is the misdemeanors, real or fancied, of this bird that have brought the whole of its relatives into disrepute. This is not so much the result of reasoning regarding analogy of habits in different species, as it is the effect of looseness in nomenclature, of confusion in the names of birds in different sections. For instance, in New England the hairy woodpecker (*P. vellosus*) and the downy woodpecker (*P. pubescens*) are both called the sapsucker; and in the western States the yellow-bellied woodpecker (*S. varius*) is generally known by that name, though in some localities all the species are called sapsuckers, as the following incident will show: During a surveying excursion in Ohio in the spring of 1865, I was with a party of woodmen and surveyors for a number of days. On one occasion a yellow-bellied woodpecker was busy in knocking off the bark of a dead stub, and such was its industry that I was permitted to approach within 20 feet of its station.

"What are you looking at that plaguey sapsucker for?" inquired one of the men. "Shoot it; it is the scamp that spoils all our fruit trees." "Pooh," I replied, "that bird is no sapsucker. Don't you see that the stub is dead, and there is no sap in it?" "That makes no difference," exclaimed one of the others; "it is only amusing itself knocking off the bark; it is a humbug." "Humbug or not," said the first man, "we'll see what it is made of;" and before I could prevent him he seized my gun and shot the bird. At that moment a red-headed woodpecker alighted on a tree near by, and at the exclamation from one of the men, "There's another sapsucker," the man, who still held the gun, fired the loaded barrel, and the second bird fell to the ground. I saw that an opportunity had arrived in which a useful lesson might be taught these men. Taking the birds, I showed, though they had been regarded as of the same species, they were entirely different, and consequently but one could be the true sapsucker. I then proceeded to dissect both specimens. In the stomach of the yellow-bellied woodpecker I found the grubs of five boring beetles, the wings of at least a dozen small wood-eating beetles, some ants, and a little vegetable matter. In the stomach of the red-headed woodpecker were two or three of the stones of some small berries, some ants, a beetle, and seven grubs or borers. It was a tangible fact to these men that the woodpeckers, instead of subsisting upon the sap of trees, were eminently insect feeders, and it was gratifying to me to hear them, a day or two afterward, telling some of their friends what I had discovered to them, and cautioning them against killing "sapsuckers." I would

remark that these same men, before I left them, learned to distinguish the difference between the hairy, downy, red-headed, and yellow-bellied woodpeckers, all of which they had until then called sapsuckers.

The following memoranda, made in different localities and at different periods, will give an idea of the diet of some of our small woodpeckers: Of the downy woodpecker—"March 8, contents of stomach, stones, larvæ of small insects;' "March 12, larvæ and insects;" "March 21, large seeds and insects;" "June 2, small insects and stones;" "September 10, soft worms and larvæ;" "September 16, small insects;" "November 24, seeds, grubs, small insects:" "November 30, seeds and larvæ;" "January 2, small insects and stones." Of the hairy woodpecker I have but two memoranda: "September 28, contents of stomach, larvæ of borers and ants;" "March 4, larvæ and insects, apparently a few pieces of bark or other vegetable matter." Golden-winged woodpecker or flicker: "October 14, seeds, one beetle;" "October 23, pieces of apple, a wasp, small insects;" "October 19, small insects;" "November 10, ants." Yellow-bellied woodpecker: "September 17, black ants, pieces of bark;" "October 9, barberries, partially dried, beetles;" "October 10, a few beetles;" "October 21, a few larvæ and ants;" "March 9, small insects and ants."

I think that, when the foregoing testimony is read, the usefulness of the woodpecker, not even excepting the sapsucker, will be acknowledged by all candid minds. In addition to this evidence, I would submit the observations of the earlier and well known writers on ornithology, for the purpose of corroborating the facts presented.

Audubon says:

> The yellow-bellied woodpecker prefers the interior of the forest during the spring and summer, seldom showing itself near the habitations of man at those seasons. Its food consists of wood, worms, and beetles, to which it adds small grapes and various berries during autumn and winter.

Wilson says:

> The habits of this species are similar to those of the hairy and the downy woodpeckers, with which it generally associates. The principal food of these birds is insects, and they seem particularly fond of frequenting orchards, boring the trunks of apple trees in their eager search after them. On opening them the stomach is found generally filled with fragments of beetles and gravel.

Speaking of the downy woodpecker, he says:

> Mounted on the infected branch of an old apple tree where insects have lodged their corroding and destructive brood in crevices in the bark and the wood, he labors sometimes for half an hour before he has succeeded in dislodging and destroying them. Were the sap of the tree his object, the saccharine juice of the birch, the sugar-maple, and several others, would be much more inviting, because more sweet and nourishing than that of either the pear or the apple tree; but I have not observed one mark upon the former for ten thousand that may be seen upon the latter. Besides, the early part of the spring is the season when the sap flows most abundantly, whereas it is only during the months of September, October, and November that he is seen so indefatigably engaged in orchards, probing every crack and crevice, boring through the bark, and, what is worth remembering, chiefly on the south and the southwest side of the tree, for the eggs and larvæ deposited there by the countless swarms of summer insects.

Dr. Henry Bryant, of Boston, one of our most careful and unprejudiced ornithologists, examined the stomachs of several specimens of the yellow-bellied woodpecker, and makes the following observations regarding the species:

> The general shape of the whole tongue is not much unlike that of the robin; the ciliated edges show an analogy to the *meliphagidæ*, and indicate that the sap of the trees pecked by them may form a portion of their food. In the stomachs of the six individuals examined by me, fragments of the inner bark were found in all, so that it can hardly be presumed to have been accidentally introduced. Insects, however, probably form their chief diet, as all the stomachs examined also contained insects, the quantity of which was greater than that of the fragments of bark. In one bird there were two larvæ of a boring beetle, so large that there was not room enough in the stomach for both at once, and one remained in the lower part of the œsophagus. If these were, as is probable, the larvæ of the saperda, they would do more damage than twenty woodpeckers.

That the cuckoos are also, in a great measure, unjustly accused of mischief, I

am convinced. Memoranda of the contents of stomachs of our two species, from many localities, all agree in giving caterpillars and canker-worms as the principal objects. They both occasionally make a piratical raid on the eggs or young of their neighbors. But such occurrences are rare; and, since, if the parent birds show a decided resistance to the invader, the cuckoo, which is a coward, beats a hasty retreat, the mischief done must be very small indeed, when compared with the benefits rendered the farmer in the destruction of myriads of noxious insects. I would unhesitatingly recommend them to the protection of agriculturists in all sections.

There now remains for our consideration but one family of our birds which have attracted the attention of farmers and others in consequence of their depredations; and this, the corvidæ, (comprehending the crows, jays, &c.,) is worthy of careful examination. These birds unquestionably render some benefits to agriculture by destroying noxious insects; but it is also undeniable that they do infinitely more mischief by robbing the nests of small beneficial birds. I have, until recently, been the champion of the crow and its relatives; but, after carefully observing their habits, I have been compelled to acknowledge that the ill-repute in which they are held is well deserved. Cases innumerable have come to my knowledge where orchards have been depopulated of robins and other birds by the common crow, (in one instance four nests of young birds were killed in one day by a single pair of these pirates,) and the mischief thus done can hardly be estimated.

Let us examine the habits of the crow through all the seasons of the year, and adopting the system of numerals of the relative values of the bird before employed, ascertain the real character of its operations on the farm. During the months of January, February, and March, when the face of the country is covered with snow, the insects being dormant and the small birds away to more southern districts, most of the crows migrate from the northern to the southern States. The few that remain depend upon a scanty subsistence of seeds of wild plants and weeds, acorns, and apples that have been left on the trees in the orchard and frozen, and they occasionally capture a field-mouse that strays from its nest in the stubble-field or swamp. The life of the crow, during these months, is one of continued starvation, and the expression "as poor as a crow" may be applied to it, as well describing its condition. It succeeds in finding the cocoons of a few lepidopterous insects, meets occasionally with a beetle or larva; on the whole, its labors during these months may be called beneficial, although the good resulting from them is of so little amount that we might safely regard it as neutral. But to be beyond the chance of doing it an injustice, we will assume that during the three months above-mentioned the crow does as much good as during the month of April.

Taking the unit one to represent the labors of each day, the crow is valuable during January, February, and March, 30 units; and in April is unquestionably 30 units more; for its food then consists almost entirely of noxious insects in their different forms. It is perfectly safe to say that it destroys 1,000 insects daily, and it is not improbable that it often exceeds this number. During the first half of May its labors are undoubtedly beneficial, for its food still consists almost entirely of insects, but, after the middle of that month, when the small birds have begun to lay their eggs and hatch their young, the crow divides its diet pretty equally between them and the insects. Now it is not apparent, at the first glance, how immensely injurious it becomes the moment it begins to destroy the eggs and young of small birds; but we can demonstrate it to an approximation. We will allow that during the latter part of May half of its food consists of injurious insects and other vermin. It is, therefore, beneficial in the whole month about 23 units; but it is perfectly reasonable to assume that it daily destroys the eggs or young of at least one pair of sparrows, four in number; one pair of warblers, four in number, and one pair of thrushes or starlings, four in number; for I have known one pair of Canada jays to kill and devour the

callow-young of four pair of snow-birds *(Junco hyemalis,)* 16 birds in all, in one forenoon. Now let us see what the injury amounts to when the crow destroys the four eggs or young of the sparrows, warblers, and thrushes. As remarked on a preceding page, the young of all our small birds are fed, while in the nest, upon soft caterpillars and insects. Bradley says that a pair of sparrows will destroy 3,360 caterpillars for a week's family supplies. For four weeks, at the lowest estimate, the young of our sparrows are fed on this diet, and the family that the crow destroys would, in that time, eat at least 13,440 insects; and as they feed more or less upon the same diet during their stay in the north, killing certainly as many as 50 each, daily, the family would devour 200 per diem, or, before they would migrate in September, as many as 20,000. The warblers are entirely insectivorous, and we can certainly allow them as great destructive capacity as the sparrows. The four that the crow destroys would have devoured, before the autumnal migration, at least 30,000 caterpillars and grubs. A pair of thrushes have been seen to carry over 100 insects, principally caterpillars, to their young in an hour's time. If we suppose that the family mentioned above is fed for only six hours in the day, they would eat 600 per diem, at least, while in the nest, which, being three weeks, the amount would be 12,600, and before they would leave in the fall, allowing only 50 insects each per day, a very small number, they would, in the aggregate, kill 20,000 more. Now, we find that the crow, in one day, destroys birds that would together eat 96,040 insects before they would leave for their winter homes, or about 96 times as many as it would eat in a day if its food consisted entirely of the same. It is, therefore, injurious during the last half of May, keeping our original calculations in view, 598 units.

During the whole month of June and the first half of July, it is at least doubly destructive; for its young are possessed of voracious appetite, requiring an abundance of food to supply them. Allowing, then, that of the diet of the parent bird and its young, half consists of insects during this period, it is beneficial about 46 units; but as at least one-half of the other half consists of young birds and eggs, it is injurious during the same period at least 96 units daily, or 4,320 units for June and the first half of July. The remaining quarter of their food during this time consists of berries, and various small seeds and reptiles; and this diet may be considered as of neutral importance, economically speaking. During the last half of July, and through August and the first half of September, its diet consists of about half insects and mice, and the balance of berries and small fruits. It is, therefore, during this time beneficial about 30 units, and is not injurious otherwise than by eating garden fruits or grain, items that I have not considered in connection with its food during the year. From the middle of September until November its food loses much of its fruit character, because of the failure of supply, and it feeds at least two-thirds on insects and other noxious animals. It is, therefore, beneficial 30 units, and is not injurious; and during November and December it is beneficial to about the same extent that it is in February and March, or about 40 units.

We now find, in a general summing up of the crow's merits and demerits, that during the whole year it is beneficial to the amount of 229 units, and that it is injurious to the extent of 4,918 units. If, for the sake of the greatest indulgence, we take but one-tenth part of this enormous disproportion as the actual fact, we still have an exhibit that proves at once that these birds are not only worthless, but positively injurious.

The limits of the present sketch are such that I have been unable to present more than a brief account of the habits of some of our more familiar birds; and there are many species, even whole families, that I have not mentioned, but those presented have excited the greatest controversy among agriculturists; and if I have been able to throw any light upon the subject, or have fortunately been able to remove a little of the prejudice existing against some species, I shall feel that my labor has been a pleasant one, and that it has been well rewarded.

WINTER BEE-KEEPING.

By Mrs. Ellen S. Tupper, Brighton, Iowa.

The winters of 1865–'66 and 1866–'67 were most disastrous to bees. Throughout the whole west and northwest many apiaries were decimated, and there were few bee-keepers who did not lose more or less colonies. I have taken much pains to ascertain the cause of this general loss, to discover if it was necessary, and if not, to find a sure way to prevent the like in future. To this end I have corresponded with bee-keepers in all parts of the country, receiving letters from every State in the Union, with many statistics, and from all these I am confirmed in the opinion, that all losses of bees in winter may be avoided, and that a proper knowledge of the laws which govern these insects may be made useful to such a degree as to render bee culture most certain in its results, and more independent of changes in seasons than any other rural pursuit.

A brief notice of the causes of unsuccessful wintering will be profitable. From all the facts which I have gathered, it appears that the greatest loss was not in the coldest sections of country, but in those where the greatest and most sudden changes occur. In Maine, Michigan, and Minnesota, the loss was trifling compared with that sustained in Iowa, Illinois, Missouri and Kentucky. A colony of bees of proper size to maintain the requisite heat cannot be destroyed by cold. Nature has bestowed on them the power to maintain the requisite warmth for safety, if their owner will aid them in keeping their numbers good, for in strength of numbers is their protection against cold.

Where bees are wintered (as they are in a majority of cases) out of doors, and mild, pleasant days come frequently during winter, many bees are drawn from their hives by the bright sun to become chilled and lost; and thus the cluster becomes smaller and smaller until it cannot maintain the proper temperature when the extreme of cold follows. In steady cold winters, where bees remain in a semi-torpid state and continue in the hive for months, the cluster does not grow smaller, but on the contrary is often found larger in size in the spring; because when food and warmth are abundant, brood rearing commences in December, and numbers of young bees swell the swarm by April. It is well to remember that neither of these winters which proved so disastrous to bees was peculiar, and therefore we must look further back for the causes of the loss. The spring and early summer of both these years were very favorable. The secretion of honey was unusual, and bees (as their instinct always prompts when honey is abundant) reared much brood, and where swarming was allowed multiplied greatly. Had the yield of honey continued good, all would have been well. But, on the contrary, after July 20th, in many parts of the northern and middle States, owing to various causes, little honey was secreted; and even the autumn pasturage, usually of greatest value to bees, failed entirely. Keepers found themselves with colonies largely increased in numbers, but too often occupying hives nearly empty of honey. In instances where from some cause bees had not swarmed, sufficient honey for winter use had been gathered; but the unfavorable autumn weather checked brood rearing a month earlier than is usual, and therefore many colonies went into the winter weak in numbers, though with honey enough. Thus many keepers met in the spring with the (to them) unaccountable accident of hives heavy with honey, but no live bees in them; these having perished for want of sufficient numbers. One great cause of loss in these seasons

was that agents of movable comb hives of various kinds had introduced them largely all over the country, with no care to impart the information necessary to enable bee-keepers to use the hives aright. I believe the movable comb principle in a plain hive indispensable to successful bee culture; but the very facility with which bees can be divided in these hives makes them dangerous in the hands of those who are unacquainted with the nature and instincts of the bee. Too many bought them with the idea that once in them bees might be multiplied at will, and agents too often encouraged the idea. The result, as might have been anticipated, was most disastrous. In many counties where these hives were largely sold and used, hardly a living colony of bees could be found in them the succeeding spring. Bees had been transferred, divided and subdivided, until nothing but empty hives remained. Of course the hive was (most unjustly) held responsible for the loss. By others it was thought and asserted that some fatal disease had prevailed among bees to cause such mortality; but investigation into the facts has not disclosed a single instance where this was the case. Complaints of dysentery, foul brood, and other diseases, proved incorrect, all such troubles having been caused entirely by cold, damp, or insufficient food and ventilation. If, then, all loss was occasioned by unwise increase, naturally and artificially, of colonies, prompted by a good yield of honey in swarming season, and succeeded by unusual scarcity in late summer and autumn, what security have bee-keepers in the future? I believe it possible so to keep bees that all colonies may be safe under all circumstances in any season; and also to make them profitable always. This is not theory alone with me, for in ten years of bee-keeping I have had no loss to complain of, experience fully sustaining my theory. A strong colony of bees in a well-made, movable comb hive, of proper size and shape, is always safe, can take care of itself against all enemies, and may be wintered anywhere, if properly ventilated and stored with sufficient honey. All will agree in this, and the inquiry is how bees may be kept in this condition. Swarming is the way which nature provides for an increase of colonies, and if bees are not allowed to swarm they should be divided in a manner resembling their natural way of increase. Division, or artificial swarming, may be so managed as to prevent any injury to the parent colony, if the principle which governs the matter be understood, and no step taken counter to the instincts of the bee. Bees may be increased largely if care be taken, but where one has not the time to bestow it is wiser to be contented with making one new colony from each old one in a season. Even this rate of increase, though it may be safely made, will, in some seasons, prevent the storing of much surplus honey. Where surplus honey is more an object than increase of stock, it is always best to make one new colony from two old ones, which practice is recommended to all beginners as always safe and sure to give most surplus honey. Divisions should be made as early in the season as the bees may be in proper condition. The value of all, both old and new, is increased when swarming is over by the first week in June. Those who depend on natural swarming for an increase of stock, are often troubled by over-swarming. They would be glad to prevent more than the issue of at least one swarm yearly from every hive. There is one sure way to prevent this. So soon as a swarm issues, remove the hive from which it came to a new location, some yards away, and place the hive into which the new swarm has been put directly where the parent hive stood. The principal part of the mature bees will thus find their way into the new hive, and that will be very strong, while the old hive will contain few except young bees, and, though it will soon be populous, no after swarm will issue. I have seen this tried in hundreds of cases without a failure, and believe it a perfect and simple way to prevent the issue of after swarms.

I find that there are bee-keepers in all new parts of the country who cannot conveniently winter bees in a cellar or house, as is always best when possible. They must winter them for the present on their summer stands, even if such a

course does involve the consumption of a greater amount of honey. Such will find no trouble if they use a square or upright form of hive; be sure, by actual weight, that the bees have honey enough, and have ventilation at the top of the hive, that moisture may escape and air pass freely, even if the entrance holes at the bottom become blocked with snow or ice. The hive known as the American I find most simple in construction, with the fewest unnecessary complications, and by far the safest winter hive. The quantity of honey necessary to secure safety to a colony through the winter varies much with locality and season. By weighing a number of strong colonies last year, it was found that the average consumption was, in October, 4 pounds; November, 4½ pounds; December, 2½ pounds; January, 3 pounds; February, 3½ pounds; March, 5 pounds, and April 7½ pounds. Judging by this, no colony should contain less than 30 pounds when the yield of honey ceases in the fall. It is better to allow too much than a scanty supply, as the greatest consumption comes in the spring for brood rearing, and if the supply is scant then, little brood will be reared until flowers bloom.

If colonies have not enough, it is, in most cases, best to unite them with others, making of two or more one good stock. This is the safest and least troublesome way. There are, however, many who are anxious to increase their bees, and unwilling to lessen the number of colonies in the fall, if it is possible to save them all. They do not regard the expenses, if, by the purchase of food, they may secure safety and prosperity to all their weak colonies. These may feed their bees, and, by judicious care, build them up into good valuable stock. A little timely expenditure of sugar would, I doubt not, have saved thousands of colonies the past two years. Feeding, to be of value, must be so managed that the supply shall be so regular as to seem to the bees like their own stores. Spasmodic feeding, allowing the bees to suffer from want of food, and then giving them large quantities, is worse than useless. It should commence when bees first cease to find honey out of doors, and then continue so regularly that they may never want until blossoms appear in the spring. How to do this was the difficulty, but a feeder has been patented by Edward Harrison, of Springfield, Ohio, which supplies a want long felt by bee-keepers. By its use the food is placed directly over the cluster, where it is always at hand, and can be reached by the bees in the coldest weather. It can also be filled without disturbing the bees, and no robbers are attracted by it. Its cheapness and simplicity will make it indispensable to all who, for any reason, are obliged to give aid to their bees. No one must attempt to feed any colony weak in numbers, unless it can be kept in a cellar or room where the temperature is above the freezing point. It is claimed for the Italian bee that it is more hardy than the common variety. I think the difference is in the fact that the Italian queens are more prolific, and the bees rear more brood, under the same circumstances, and thus go into winter quarters with a stronger garrison. Their ability to gather honey from plants which the other bees do not visit, is a great gain to them in poor seasons. In years when no common bees for miles around stored honey in boxes, no colony of Italians in an apiary of hundreds failed to store some. The late unfavorable seasons caused many to fear that some sections of the country were becoming overstocked with bees. That these fears are groundless is proved by the fact that the largest apiaries suffered least, and not one instance is recorded where an apiary well managed has not proved profitable. I have known instances where only half a dozen colonies were found on a square mile, and every one starved, while on the adjoining mile, possessing precisely the same resources, 200 colonies found enough to winter on. The former were weak in the spring, and the best of the season passed before they were in condition to do anything. When all bee-keepers keep all their colonies strong at all times, we shall hear no more about over-stocking, or loss of bees in winter.

FEEDING BEEF CATTLE IN THE MIDDLE STATES.

By William C. Lodge, Claymont, Delaware.

GRASS-FEEDING BEEVES.

Without entering into a description of the relative merits of different breeds of stock cattle and their general adaptability to grazing or feeding purposes, I simply propose to consider such as have proved most profitable to the grazier and feeder of the middle States. It is also my purpose to show the influence of the different kinds of grasses, the quality of the soil, its "lay" or exposure, and the effects of the drinking-water upon the stock; for it is essential to have a combination of these advantages in order to make beef of the best quality and largest quantity in the shortest time.

FEEDING DISTRICTS.

An examination of the large beef markets throughout the country will indicate quite conclusively such localities as are best adapted to grazing and feeding purposes, except, perhaps, in the case of metropolitan New York city, where the demand is such as to induce the best beeves to be brought from extraordinary distances.

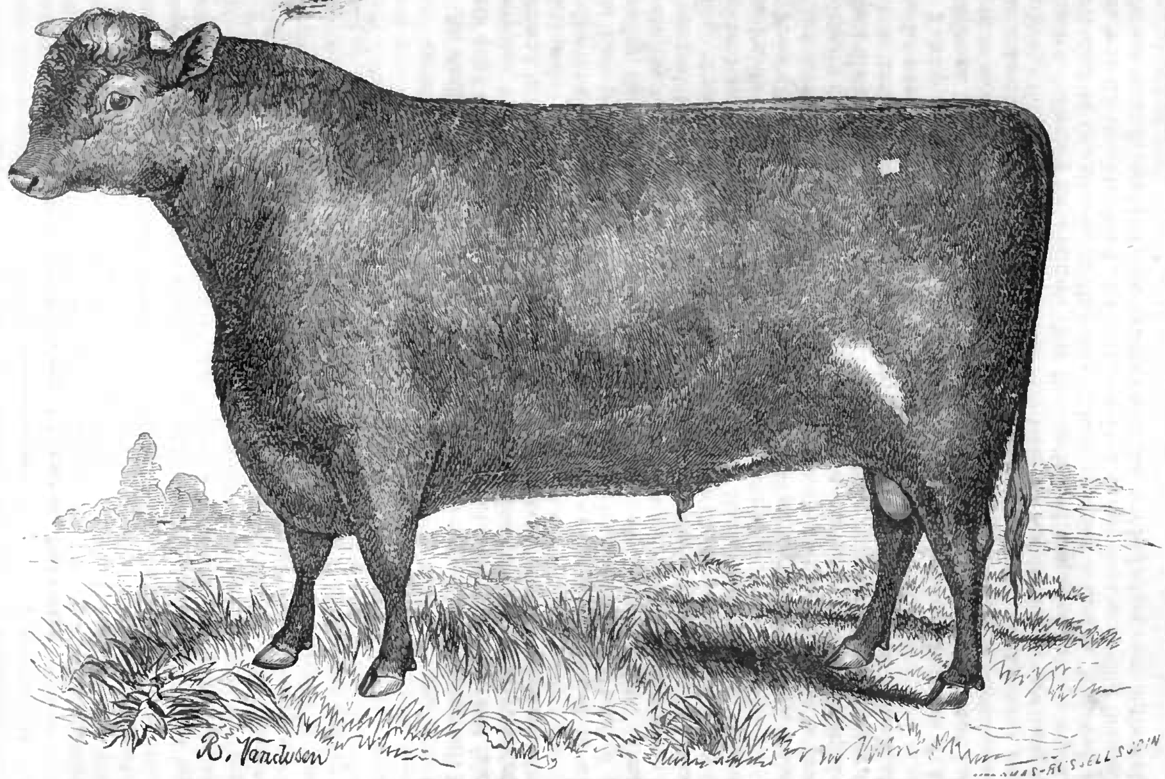
Beginning a tour of inspection in September or October, a period in which the best grass-fed beef is exposed for sale, we find in Montreal beef of poor quality, dark in color, and with little or no admixture of fat and lean. Coming south, by way of Portland, Boston, Buffalo, Hartford, and Harrisburg, we find a gradual improvement, while the quality culminates to perfection in Philadelphia. From Philadelphia west, following nearly the fortieth degree of latitude, we find in Wheeling, Columbus, Indianapolis, Springfield, Quincy, and on to the Pacific ocean, the same perfection as to quality.

From Philadelphia going south, by way of Washington, Richmond, Raleigh, Charleston, Montgomery, and on to New Orleans, the deterioration is proportionately more rapid than is the improvement in coming toward Philadelphia, an equal distance north of that city. Hence we infer that the belt extending from the Atlantic to the Pacific ocean, nearly on the fortieth degree of latitude, offers the best facilities for successful feeding.

Taking, in the month of February, the tour indicated, we shall not find the difference in the quality of the beef so marked, owing to the fact that Indian corn is used as the principal food. It is, therefore, in all these particulars—in the difference of climate, the hay or fodder, and the general management, as well as in the breeds of cattle—that we may look for excellence in any designated locality. Taking for granted that the stock and management are equal, we will find in Charleston, at this season, beef superior to that in Montreal, inasmuch as the neighborhood of Charleston is then free from annoying insects, the climate most favorable to the taking on of fat, while Indian corn is then cheap and abundant.

In the latitude of Montreal the intense degree of cold would cause a considerable consumption of food or fat, in order to generate or preserve the required amount of animal heat. The localities equi-distant between the extremes, which would be about the belt referred to heretofore, would still possess advantages over all other sections, for here we find grain in greatest quantity, hay perfectly

PLATE XVII



LOYAL DUKE OF OAKLAND.

Short-horn Bull, bred and owned by D. McMILLAN, Xenia, Ohio. Calved August 20, 1866; got by Grand Duke (3,985) out of Duchess of Oakland by Duke of Thorndale, (2,787,) Prizeflower by Prince Charlie, (13,503,) Lily by Fitz Leonard, (7,010,) Quartz by Granite, (7,047,) Beauty by White Bull, (5,643,) Young Broadhook by Young Lady Kirk, (4,170,) —— by Albion, (731,) Europa by Sirius, (598,) Short Tail by Wellington (679,) Honeysuckle by Sultan, (631,) Jane by Signior, (588.)

cured and rich in saccharine matter, as well as the most careful and experienced feeders. We may, therefore, safely infer that the selected district offers advantages superior to all other sections of our extensive domain for the production of the article of beef.

From this favored district I will select Philadelphia as the centre, with a radius of 100 miles, as specimen feeding grounds; not because the area embraced is the best, but because a representative for nearly every variety of soil in the country is there found. The counties which were pronounced by Colman the best adapted of any in the country for the purposes of grazing and general cropping—represented by the county of Newcastle, in Delaware, Delaware county, in Pennsylvania, and the fertile pasture grounds of Chester county, along the Brandywine—are included within these limits, together with the bush and swamp lands of New Jersey, the barren hills of Pennsylvania, and the sandy flats of southern Delaware and eastern Maryland.

The observing traveller, passing from one section of these specimen feeding grounds to another, would readily notice the superior size and quality of the cattle feeding on the hilly or rolling pastures, watered as they are by clear and ever-running streams, as compared with those on the level, sandy lands, however fertile they may seem or abundant the grasses they produce.

The experiment of feeding precisely the same grades of cattle upon the high or rolling pastures and the levels has frequently been tried with the almost invariable result. Those on the highlands fatted in less time, and mixed their lean and fat (or *marbled* their flesh,) while those on the sandy levels made tallow almost as plentifully, without the desirable admixture of fat and lean that goes to make up superior beef.

QUALITY OF PASTURES.

Judge Tenbroeck, who annually sent large droves of grade Devons from the New York counties bordering on Lake Erie to be fed by the graziers in this district, confesses his admiration of the beef made of his cattle. To use his own expression, "not all the grass in northern New York will make such beef of the same bullock as you can make from your ordinary grasses." Cattle will improve or deteriorate by a change of pastures for better or worse, so as almost to lose the characteristics of their peculiar breeds. Thus the Durhams, on the luxuriant pastures of Ohio and other first-class feeding grounds, are the perfection of the bovine species. Noble bulls of this breed have been taken to the sandy flats of the Atlantic seaboard, where the pastures were thin and short, and have rapidly degenerated, and their progeny have generally been so merged into the native stock that in two generations all traces of the high character of the ancestor have been lost.

It will be seen that abundant pasture without regard to quality is not *all* that is needed in order to produce good beef, and make it in a short time. Red clover is best suited to light soils and level situations. Timothy and herdsgrass thrive on heavier soils, low and damp. Those grasses are produced in double or treble the quantities per acre of the natural blue or green grass and white clover, which delight in hilly or rolling situations. Yet the latter are greatly preferred by the cattle, and will make better beef in a shorter time than the artificial grasses, however luxuriant.

EXPOSURES OR INCLINATIONS.

Some lays of pasture lands are more valuable than others when the soils are equally fertile. Those having a southern tendency are most desirable, and the herbage upon them is greatly preferred by the cattle. Indeed, to so great an extent is this the truth that cattle having unlimited range will keep the southern exposures continually eaten bare while rich pastures offer in vain their tempting

abundance. The sun, doubtless, gives the grass more strength, maturity and sweetness by its direct rays upon it, as well as by its modifying influences upon the soil. Most graziers have some acquaintance with what is known as

SOUR SOILS.

These are generally level, low and undrained meadows, often producing a large amount of grass, which the cattle refuse to eat so long as they can procure sustenance elsewhere. The produce, either as grass or hay, is never keenly relished by the animals, and will make neither milk nor beef in any considerable quantity. Such meadows are frequently sweetened by thorough draining, or made better by ploughing in the autumn, so that the winter frosts may disintegrate the particles and allow the sun's rays to penetrate and ameliorate the upper soil. Laid down in grass again the succeeding autumn, with a slight dressing of lime, the pastures become, and for a time remain, almost as rich and desirable as those in any other situation.

MOST PROFITABLE STOCK.

It is not to be supposed that the feeder raises his own stock. This is a separate branch of the cattle business, and those who follow it are known as "stock raisers," or "stock producers," as distinguished from "stock feeders." Different localities suit the two branches of the business. Sections remote from the markets, where land sells at a comparatively low price, answer better for stock-raising than feeding, as the lean or store bullock may be driven or transported a great distance without injury, while the fatted animal rapidly diminishes in both weight and quality by any mode of transportation, however careful may be the treatment on the way. We therefore purchase in spring or autumn, as our design is to graze or stall-feed, such stock as we know to be best adapted to our pastures or mode of feeding. A wide range is offered for our selection in the droves that concentrate at our stands from all sections of the cattle producing States. Here we find the fine grade Devons from counties contiguous to Lake Erie; the mountain cattle from the Alleghanies; the Humlies, Mulies or Dodded, and other smaller cattle from the flat, sandy portions of Delaware and Maryland; the superior Greenbrier stock from the hills of Virginia; the magnificent Short-horns or Durhams from the Western Reserve, from portions of Indiana and Illinois; and even the stately Missouri and Texas herds come marching with their lofty horns erect like battalions of soldiers. Cattle of every age, color, size and quality are offered by the drovers in the months of September, October, and November, at the various yards throughout the country, and at all seasons of the year at the city drove yards.

The demand that creates the supply of such various breeds and almost opposite characteristics is sufficient evidence that no single breed or grade of cattle, however many excellent points may be comprehended, will be best in all respects for all localities.

So much depends upon the exposure and situation of the feeding grounds, their fertility, the quality of grass and water, and many other considerations, that no general rule can be adopted as applicable to all farms. The grazier soon learns from experience what particular kinds of stock can be most profitably fed by the means within his reach, and makes his selections accordingly.

For our own fertile rolling lands along the Brandywine, the Schuylkill and the Delaware rivers, cattle of the highest types, represented by the Devons and Short-horns, are generally selected, and most of the prize beeves in the Philadelphia and New York markets are fed on these luxuriant pastures. But the sandy levels of the Atlantic coast require smaller and a different style of animals. We would, therefore, conclude that the water, situation of the pastures,

both as to exposure and drainage, as well as the natural fertility of the soil, should determine the kind and quality to be fatted.

MOST PROFITABLE AGE.

The age at which a bullock may be most profitably fatted is, with feeders, still a matter of difference. Many prefer a two-year old, as the gain in growth from two to three years is by them considered greater than at any other period, while the same amount of food will prepare them for the butcher almost as soon as at a more mature age. Others maintain that growth is at the expense of fat, and that the same food cannot produce both growth and fat in the same ratio as the one condition of fat alone. Therefore, more maturity is desirable, as the growth will then so proportionately diminish as not to be an equivalent for longer keeping, and the beef will be in perfection as regards tenderness, juiciness and richness. We shall then, also, have the advantage of an early market, as the animal will put on fat more rapidly, and the gain of a month, when the prices are highest, is often equal to one-half the profit of feeding. Another gain will be in the longer rest of the pastures, as the interim will be extended between sale and purchase of new stock.

I shall therefore adopt the age of from from three to four years as the most profitable age at which to begin fattening by grazing. Most graziers purchase their stock in the autumn or early winter, in order to feed to them the rough hay, straw, and corn-fodder, and thus convert it into manure. Others, who lay in no supply of winter provender, purchase in the spring as soon as the young grass starts, and turn the cattle at once upon the pastures, where they remain until finished for the butcher, which requires a period of from four to seven months, according to the season and the aptitude of the bullock to take on fat. The prices of stock cattle range about the same per pound in spring and autumn, the gain in weight and manure being considered an equivalent for the winter's keep.

WINTER, OR STALL-FEEDING ON GRAIN.

In different sections the manner of winter-feeding varies somewhat, particularly as to the time of purchase of the stook and its preparation for the stalls. Our custom is generally to lay in steers four or five years old, of good quality, large size and high condition, in September or October, turning them on the pastures, which have been resting since the grass-fed cattle were driven to market, some six weeks previously, and having them well "started" on the young and sweet grass before confining them on dry feed. A good start is a consideration with practical feeders, and he is deemed unskilful who allows his cattle to retrograde in the least degree, as it requires double time and feed to regain the loss that would suffice to keep the bullock in a continuous thriving condition.

The signs of an unthrifty or retrograding bullock are a dry, staring coat, or hair standing on end instead of inclining in the natural way, sleek and smooth; a propensity to lick—generally to lick the hair against the grain or opposite the natural inclination. The latter, however, is not an infallible evidence of unthriftiness, as any change of condition, either for better or worse, is indicated by the animal licking himself. An experienced eye will readily notice the difference between the thrifty and unthrifty lick, which is difficult to describe without actual demonstration so as to make it plain to the inexperienced.

I have heretofore treated of the management of steers from three to six years old. In regard to oxen, particularly those of large size and mature growth, it is desirable to add as much weight as possible, and all weight must be made by fat after growth has ceased. We therefore take the ox simply as a frame on which to accumulate the greatest amount of weight, without such especial regard to the time of accomplishing it, as in the case of the grass-fed steers. Being of much

greater size, we naturally suppose the time required for fattening will correspond. This is not often the case, yet more time is generally given as the ox is made fatter than the steer proportionately with his size.

A good portion of the summer pasture will further him greatly in his winter feeding, and he is released from the yoke as soon as the warm weather of July and August sets in, so that he may range at will over the rich pastures, drink of the running streams, and recline at ease in the cool shades.

His situation, in contrast with his former life of drudgery, partakes somewhat of the Elysian order, and he seems to appreciate the change by his rapid improvement in condition. By the time we are ready to commence stall-feeding him with grain, he is in fine condition and needs only to be finished to any degree of fatness required. Once in the stalls, we give each ox of fair size (say, by estimate, from 900 to 1,200 lbs.) the allowance of four quarts of Indian meal at each feeding, morning and evening. This amount is gradually increased until in the course of a week or ten days it is doubled, and if desirable to hasten the process, again doubled in two weeks more. This will make one bushel a day, a quantity greater than is generally used, but may, with care, be fed to advantage. Without care, however, the animal is at some period liable to refuse his food altogether, when a change must be resorted to in order to restore the appetite. This disgust for his food generally occurs during continued sultry or wet weather, and the careful feeder will anticipate it by a change, or by decreasing the amount of food in time. The animal will really thrive much better in such weather by a considerable decrease in his allowance of food than on his usual quantity, eaten without appetite.

The preceding rules are based upon the supposition that the animal is furnished with a continual supply of hay or fodder of the best quality, and a handful of salt once in a fortnight, or free access to salt in the yard.

The very old truth that "a beast thrives under the eye of his master" means, simply, that in order to prove a successful feeder one must be influenced by something more than the idea of prospective gain. The feeder who follows the business as a pleasure will, in most cases, be successful in point of profit; for it implies interest to anticipate the requirements of the animal, to provide for his comfort so that his condition will always be one of ease and satisfaction. Any show of uneasiness or anxiety will affect the health of the beast as it will a member of the human family, and tell more plainly on his condition. We should, by kind treatment, an occasional change of food, and by a careful anticipation of his wants, so provide for the comfort of the animal as to leave nothing to be desired by him.

FOOD.

Indian corn has been adopted as the staple cattle food for the middle States, as it furnishes both the carbonaceous or fat-producing element, and the nitrogenous or flesh-forming qualities in a greater degree, compared with its cost, than any other grain, or any combination of articles used as food. There is, however, some difference of opinion on the subject, though our experience has confirmed our original views. The English give decided preference to the oil-cake. But with them it is a choice between the oil-cake, roots and oatmeal or bran, Indian corn being out of the question. Some farmers in this country follow the English plan of oil-cake and roots; the roots or other alternative being necessary to correct such concentrated and heating food. There is also a difference of opinion as to the economy of

COOKING OR STEAMING FOOD

From a series of experiments conducted for the purpose of determining the relative amount of fat or weight produced by raw or cooked food of the same quantity and quality, I conclude that from a fourth to a third less cooked food

will make the same amount of fat, and be eaten with a greater relish. Cooked food is also conducive to the health of the animal, and will soon show in the smoothness and brightness of his hair, the liveliness of his expression and his playful disposition. Much of the coarser food, such as large clover and timothy stems and cornstalks, that would otherwise be wasted, may be cut up, steamed and sprinkled with a little meal or bran and a little salt, and so converted into a palatable and nutritious food. But when the cost of the cutting and steaming machinery, the fuel and the extra labor are taken into the account, unless the business be conducted on a large scale, the economy of the process remains a matter of doubt.

I have now arrived at the point most essential as regards the profit and pleasure of feeding neat cattle. It is the judicious

SELECTION OF STOCK.

In this business it is emphatically true that "nothing pleases without profit;" for the animal that refuses to thrive generously and kindly under proper treatment is ever an object of solicitude to the owner, and rarely repays the trouble and expense involved in his care. It behooves us therefore to make our selections with a view to the particular manner we adopt in feeding, as well as regards the quality of the food or the pastures for which they are intended. A few general rules may not be amiss, as any healthy beast that accords with them cannot fail to be of high character. In the selection of our cattle for both grazing and stall-feeding we look for the same general characteristics, more mature age being desirable for winter-feeding only. The practiced eye takes in at a glance all the advantages and disadvantages presented in the points of the animal, and at once completes his mental calculations with remarkable accuracy as to the weight of the beef when fatted and slaughtered six months or a year hence. A good judge will select a score of cattle from a drove of 100 head—every bullock, as he points him out, being superior to all others in the herd—in less time than it will require for me to describe the points that go to make up excellence. He first notes the general "make up" or form of the beast; next his hair or coat and skin, and finally his eyes, as indicative of his general disposition. As to color, there is a variety of opinions; a dark red being generally preferred, and a white or black least desired. But since the introduction of short-horns the prejudice against light colors has greatly abated; for there is really nothing in the color of the hair, unless it be indicative of the color of the skin, to affect the fattening qualities. A moderately thin skin, soft or mellow to the touch, with a degree of elasticity, and of a yellow color; hair, soft, long and fine; form, symmetrical and devoid of sharp points; the ribs rounded, springing well from the back, giving the body a cylindric shape; the back, a straight line from the head to the base of the tail; hips round and moderately broad, rising nearly to a level with the back; chest, broad and deep, to allow full play for the vital forces which give constitution and vigor to the beast; the legs short, neat, and the bones of moderate size and well turned, for it is of these we judge of the frame on which we are about to finish our beefy structure; thighs, full and well extended downward; head, clean and devoid of a fleshy appearance; neck tapering sharp to the head, and with little or no appendage of useless skin; tail well set at the base, slender and finished with a good brush; eyes, placid but genial, and horns of a clear color, gradually tapering to a point.

These rules might be extended, perhaps, advantageously, but I aim at simplicity, and mention such points only as may be general guides to the inexperienced. The intelligent practical feeder has his own standards founded on his own experience, and is governed in some degree by his conveniences, his resources and the climate. But where these are favorable, and the highest types of cattle are fatted, the business is the most interesting of rural occupations, and, for the labor and care involved, perhaps the most remunerative.

THE ROCKY MOUNTAIN GOAT.

Plate XXV furnishes a spirited illustration of that rare and beautiful denizen of the Rocky mountain summits, *Aplocerus montanus*, known as the Rocky mountain goat, although it is not a goat at all, but a goat-antelope, one of two species existing in North America, the other being *Antilocapra Americana*, or the prong-horn antelope, and both allied to the gazelle and chamois, the antelopes of Europe, and 80 or more varieties in Africa. They belong to the *Cavicornia* family, or hollow-horns, "ruminants with the horns permanent, hollow, and enclosing a process of the frontal bone," which includes antelopes, goats, sheep, musk-oxen, and buffaloes. There is a sheep of the Rocky mountains, the big horn, *Ovis montana*, but no true goat native to this mountain region or any part of North America. It is worthy of mention that there exists in South America no native member of the *Cavicornia* family, in any of its numerous branches.

The two goat-antelopes differ much in appearance and in geographical range Both are larger than the domestic sheep, with longer legs, and erect head and neck, that give them greater altitude. But the hair of the prong-horn antelope is coarse, thick, very spongy, and slightly crimped, while the *Aplocerus* has a white, brittle fleece, intermixed with short, soft, and silky hair. The *Antilocapra* is of a prevailing yellowish-brown color on the back, with white underneath and on the posterior part of the back. This species is found on the plains from the Rio Grande to the Saskatchewan, and as far west as the Cascade range of California and Oregon; the Rocky mountain goat-antelope only in the higher portions of the Rocky mountain and Cascade ranges, at a much higher altitude than the habitat of the *Ovis montana*, or big-horn sheep.

Aplocerus montanus is thus characterized by J. E. Gray, in the Proceedings of the Zoological Society of London: "Horns small, conical, nearly erect, slightly inclined, and recurved at tip; ringed at the base. Nose, ovine, hairy; muffle, none; tear bag, none; fur short; under fur, woolly; outer, very long, hairy, and dependent; false hoofs present." Professor Baird, of the Smithsonian, says that the horns, which are jet black, polished, slender, and conical, are much like those of the chamois. The hair is very long, covering the body, tail, and upper part of the legs; and a long, goat-like tuft depends from the chin. Dr. Richardson calls the silky under-fleece "a close coat of fine, white wool," and says the hair on the face and legs is short, but not woolly. The general appearance, erect head, chin-tuft, &c., are goat-like, but the body, as well as the downy under-coat, is more like that of the sheep.

This animal inhabits a region so elevated as to produce only mosses, semi-Alpine forms of flowers and shrubs, and a few stunted specimens of the *Pinus contorta*, with abundance of melting snow in near prospect. In the summer months it reaches a high elevation—sometimes an altitude of ten to fifteen thousand feet above the sea level—where man seldom ventures—threading with careless ease the labyrinthine way, leaping with safety from rock to rock, the male leading, often followed by several females and their young, all in single file. If frightened or fired at, they gallop along the edges of fearful precipices carelessly as they would traverse a plain, and cross a chasm, one after another, each alighting in turn upon the same spot, with more of the lightness and grace of a winged creature than is expected in the most graceful and alert of the four-footed tribes. They are extremely cautious, their senses of smell and hearing very acute, and the difficulty of obtaining specimens is therefore greatly increased. The Indians formerly pursued and captured this goat-antelope for its fleece,

PLATE XVIII.

GOAT-ANTELOPE OF THE ROCKY MOUNTAINS.

which they delivered at the trading depots of the Hudson's Bay Company, or wrought into a rude blanket or rug. Several specimens of skins have lately been placed in the British Museum by John Keast Lord, F. Z. S., naturalist of the British North American Boundary Commission, who closely studied their habits, and procured the apparatus with which the aborigines of British Columbia and Vancouver Island spun the softer wool, and obtained a specimen of the rude loom with which they wove the yarn into blankets. The following extract from an article in the "Student," (London,) by Mr. Lord, shows how the demand for this material has decreased:

> The Hudson's Bay Company take a few of the better class of goat-skins from the Indian fur trappers, but pay only a very meagre price for them. It is worthy of remark, *en passant*, that at the Hudson's Bay Company's March sale of furs for the year 1867, Rocky mountain goat-skins, although of unusually fine staple, realized only about a shilling per skin, not a tenth part as much as they made in the years 1864–5; and this falling off in value is thus accounted for: During the previous years it was the fashion with the ladies to use muffs, tippets, &c., made from the long black hair of an African monkey. The dyed hair of the Rocky mountain goat exactly corresponds with that obtained from "Jacko," and as it could be purchased for a considerably smaller sum, the demand was great for it; and hence the increased price it fetched at the auction. Now monkey-skin garments are not in vogue, the goats' hair employed to imitate it is not required, and accordingly the price has receded to a mere nothing. It is not a little remarkable that the employment of this jacket of a tropical animal should have a direct influence upon the value of one mainly confined to high northern latitudes.

The flesh is not highly esteemed as an article of food. It is represented to be tough, with a strong, rank flavor, from which even the meat of the kid is not exempt. It is not a favorite aliment with the Indians, whose tastes cannot be deemed fastidious. The body is somewhat larger than the average size of the domestic sheep.

The kids appear about the beginning of June, and twins are somewhat unusual. They are beautiful little animals, very playful, and exceedingly agile in their gambols. In the winter they descend to the range of the snow-line, and manage to obtain scanty subsistence until they are able to enjoy their favorite pasturage among the lichens, stunted grasses, and pine fronds of the mountain summits. It is found on all the more elevated portions of the Northern Rocky mountains. Mount Rainer is said to be a favorite haunt, and the higher peaks of Washington Territory abound with them. They have been seen near Fort Benton, and the Indians near Fort Simpson and among the hills of the upper Nesqually kill numbers of them.

Mr. Lord deems the *Aplocerus* a valuable animal to acclimatize, and thinks it would thrive among the mountains of Scotland, and prove a remunerating "wool-bearing animal." Its coat is very thick, and is composed of two classes of hair, one extremely long and somewhat coarse, beneath which is a short, dense covering, very fine, "as delicate in fibre and texture as that of the famous goat of Cashmere." The outer coat of hair is very long, covering the body, tail, and legs, like the fleece of the Merino, being most abundant on the shoulder, neck, back, and thighs. The beard upon the chin appears to be continued down the throat, dangling from the chest between the fore legs. There is little difference in the figures of male and female, except that the male has more development of beard and outer coat and longer horns.

It would be worth while to ascertain more definitely the precise habits and capabilities of this American animal, and ascertain its pecuniary value, before searching further through Asia for goats to acclimatize upon this continent, though the probabilities of success, unless in mountain sections, might not be strong enough to warrant much enthusiasm in the effort.

CHINA GRASS.

The nettle of the east, *Boehmeria tenacissima,* vulgarly called ramie, and by other local names in different districts of southern Asia and the islands adjacent, has excited much attention in the southern States since its introduction there by M. Roezl, in the spring of 1867, though it was first introduced into the country in 1855, from the botanical garden of Jamaica, and cultivated in the United States botanical garden, and subsequently in the experimental garden of the Department of Agriculture. It was there grown from seed—a fact that should be mentioned, a general impression having been received in the south that it is propagated only by cuttings.

The high price of cotton, and the disturbance of the economy of its culture by the results of the war, have given an absorbing interest to the feasibility of substituting ramie fibre for the southern staple, and led thousands to experiments which they otherwise never would have undertaken. The Commissioner of Agriculture, to afford an opportunity for a thorough test of a fibre of superior strength and great lustre and beauty, has imported from Paris, for trial in 1868, seed of the *B. tenacissima,* and also of the *B. candicans.* These seeds have been distributed, and many reports have been received by the Department of their failing to germinate, and yet the failure attached to the experimenter, and not to the seeds, as portions of the same importation, in every instance of trial by the Department, germinated readily. The seeds are very small and require slight covering, and being very near the surface, need protection from the rays of the sun, as well as the right degree of moisture.

THE EXPERIMENT IN THIS COUNTRY.

Since March, 1867, when the dissemination of this plant commenced at New Orleans, an interest, amounting almost to a furor, has been excited in that vicinity, and subdivisions of roots have been freely sold at a dollar each. Exaggerated representations have been made, and it is feared that the ardor of experimenters may be cooled by disappointment. There seems to be no reason to doubt its rampant growth and great thriftiness in that latitude; it has been planted in every summer and autumn month, and reports of rapid growth have been invariable; the question now to be solved concerns the economy of its production and preparation as a fibre, in competition with cotton and other textiles. It is increased, not only by root divisions, but with perfect ease by cuttings, by layering, and by planting the seed. From one root, planted in March, 1867, Mr. F. J. Knapp reports an increase of 100, and from layers and cuttings of the same more than a thousand. It is stated that in one instance 100 roots in nine months produced 40,000 plants.

The beauty, durability and value of the fabrics made from this fibre are unquestioned; the desirability of its success as an important accession to the products of American agriculture is conceded; the only point to be made clear at the present time is the profit of the production. Will it pay? That is a more difficult question, and one that should be answered; all present experiments should be directed to its solution. The plant will grow; it may yield a large product per acre. Then how can it be most successfully and economically grown? How, especially, shall it be most cheaply and efficiently prepared for the market? and, finally, what modifications and improvements in its manufacture can be made to insure a large demand for the raw material? The draw-

back to its more general use is its brittleness, which prevents weaving it by machinery, while the Chinese hand-loom is inadmissible in these days of steam and water power. Therefore, it is not used alone, but always in combination with other material, the warp generally being cotton, the weft China grass.

Manufacturers are anxious to use it; many of them have spent time and money in attempted discoveries of means and appliances for working it to better advantage. A chemical process of treating the fibre has resulted in producing, in combination with cotton, an article resembling the best mohair, a stiff, strong and cool texture, silky and beautiful. It is possible, perhaps probable, that further discoveries in this direction may give a ten-fold impetus to the manufacturers' demand. It must also be had at a low price, or it never can compete with cotton. Misapprehensions of its present marketable value are current, which should be corrected. The British imports of China grass (probably also including a portion of the fabric of the Neilgherry nettle) amounted to only 65,208 pounds in 1867, and the average cost was scarcely 19 cents per pound, while the cotton imports of the same year were 1,262,536,912 pounds, and the average cost nearly 21 cents per pound. One great want in this connection is suitable machinery for separation of the fibre, and preparation for manufacture. This was mentioned as a desideratum in the report of the International Exposition five years ago. A machine for separating the fibre has been invented by Mr. Benito Roezl, which is claimed as a success. The machine is a metallic cylinder three feet in diameter, driven at the rate of 300 or 400 revolutions per minute. It is provided with transverse bars or knives projecting from the perimeter, (for breaking up the wood and extracting it from the fibre,) in combination with alternate concave and convex table edges. The plants are first subjected to the action of the machine, then soaked in hot water, again passed between the knives and table edge, and finally soaked several hours in a solution of common lye, soap and water, heated nearly to the boiling point. The first operation strips off the leaves, scrapes away the bark, and takes out the woody substance and three-fourths of the gummy matter, and is performed with the concave edge adjusted to the table. The second is simply steeping in water to soften the remaining gum. The convex edges of the knives then soften and flatten the fibre, which is ready for manufacture after the second steeping and subsequent drying.

ACCLIMATING TESTS IN OTHER COUNTRIES.

The history of its introduction into Europe has some curious features. Sir W. J. Hooker was early interested in the experiment at a period when little was known of the plant that produced so beautiful a fibre. He identified the *B. nivea* and *B. tenacissima* as really the same species, and sought to introduce the fibre into Great Britain in large quantities, and to encourage its systematic production in British colonies, with the hope of reducing the price which it had commanded (from £60 to £120 per ton) to a figure which should encourage its general manufacture. In 1851, referring to plants then growing in the royal gardens at Kew, he says:

> Long previous even to the time when the commercial importance of the fibre became known among us we had raised this plant and had it in cultivation in a hothouse, or in a warm greenhouse. This present year we have planted it in the open ground, rather with a view of showing that it cannot succeed, than with a hope of its bearing our climate unharmed save during the hottest of the summer months. But this is no reason why the "Chinese grass" should not be cultivated, and advantageously, in our colonies—that is, such of our colonies as possess a climate nearly analogous to that of Canton; and we cannot doubt that it would, with due care, prove a most valuable and important article of export. It is only a true and correct knowledge of such plants, and of the peculiarities of soil and climate necessary for their being successfully reared, that can enable us to grow them to good purpose.

For sixteen years this recommendation was practically unheeded, but official action was finally taken in consequence of a communication to the United States

Department of Agriculture, by one of its foreign correspondents, George J. Abbot, esq., United States consul at Bradford, England, which was made public in the annual report for 1865, in a practical essay upon this plant and its products. Specimens of the manufacture, sent by the same gentleman, were at the same time deposited in the museum of this Department. The fact was stated that considerable quantities were produced in China, but that the civil war there had interfered with its production, as civil war in this country had reduced the yield of cotton; that it was then worth in England £80 per ton, and that it might perhaps be profitably grown in the southern States, and its production become a valuable addition to American industry.

Great Britain was at this time engaged in a solution of the question of the cotton supply, and this official mention at once attracted the attention of the British authorities, who immediately communicated with Dr. Hooker, at Kew, asking his opinion as to the colonies most suitable to the cultivation of this fibre. In response to despatches sent to colonial governors, facts are reported concerning experiments with this plant.

Mr. Wilson, of the Jamaica garden, from whom seed was received for the botanic gardens of this city in 1855, reports to the colonial secretary that the *Boehmeria* was introduced in 1854, was found to thrive admirably, and to produce two crops of shoots annually of eight to ten feet high. He says:

> The plant being suffruticose the shoots die down to the crown of the stool as soon as the seed ripens, and are rapidly succeeded by others, and I find by an experience of 12 years that two regular crops of growth or shoots are all that can be reasonably expected or naturally produced per annum. I have found the luxuriance of growth to be all that could be expected, and even to vie with most of our rank growing weeds. The peculiarities best suited for the most successful culture of this plant are a rather rich and porous soil, warm and moist climate, and at altitudes not exceeding 3,000 feet. In this description of land and climate the island abounds, more particularly in this country in the lower hills and abandoned sugar estates. I have distributed this plant largely, which has thriven well in general, but it is held in little estimation, being looked upon more as a weed than as containing the germ of a future new and valuable staple; however, the experiment has placed beyond the shadow of a doubt the entire eligibility of soil and climate for the full and healthy development of the plant in general. Some years ago I received a fine sample of this fibre from London, where it was cleaned from the raw material sent from India; the marketable value of this fibre was 2*s.* 6*d.* per pound, being equivalent to £280 per ton.

A report from Mr. Prestoe, of the botanic garden at Trinidad, represents that the plants thrive well there, and might be increased at a small expense to many thousands in a few weeks.

The soil and climate of the Bahamas are stated to be unsuited to its successful growth.

Mr. Home, sub-director of the Mauritius Botanic Garden, states that a few plants only were grown at the date of the reception of the despatch, but that efforts would promptly be made for their propagation, and a portion of the garden would be set apart for the especial cultivation of fibre-yielding plants, with a view of testing their commercial importance. Sir Henry Barkly, governor of the Mauritius, has no doubt that *B. tenacissima* will thrive there, as two species of the same genus are indigenous to the island; but he mentions as a drawback to practical operations with it the large amount of capital invested in the sugar manufacture, which may prevent the "larger proprietors" engaging with spirit in the enterprise, while the smaller planters, many of them natives of Bengal and presumed to be acquainted with the mode of culture, may find in it an important resource.

In the Straits Settlements little is expected unless the government shall test its profit by cultivating a small experimental patch, as was done by the Indian government in the case of tea and of cinchona.

An interesting report of the experiment in Queensland is made by Mr. Walter

Hill, director of the Brisbane Botanic Gardens, to Sir G. F. Bowen, the governor, from which the following extract is made:

I received plants of the "China grass" so far back as in 1855, from the late Sir W. J. Hooker, of the Royal Gardens, Kew. About a quarter of an acre of the Brisbane Botanic Gardens was, for two years, devoted to their special cultivation. They flourished vigorously, and required comparatively little care in their preparation or preservation. There being at the time no very tempting demand in the European markets for the fibre, and there being no machinery or appliances in the colony for extracting it, and finding that the plant had attained an exuberance and tenacity of growth which was gradually encroaching upon more ground than could be properly spared, I caused it to be removed to the border, on the bank of the river, where it can now be seen growing in a very thriving condition. Some of the fibre, however, was sent home to the International Exhibition in 1862; and, as I believe there are no means in this colony for extracting it on a more extensive and systematic scale, I have lately been contemplating the desirability of again setting apart a portion of ground for the exclusive cultivation of the plant, in the hope of being able to give a more practical illustration as to the quality of the fibre producible in Queensland, and also with a view of stimulating others to embark in the enterprise

ITS CULTURE IN CHINA.

In China the seed is gathered very carefully before the approach of frost, and when sufficiently dry is placed in a jar or basket mixed with sand or dry earth, and the vessel covered with straw as a protection against the frost. At the time of planting they are tested by immersion in water, the imperfect ones floating at the top.

The proceedings of the Agri-horticultural Society of India give an idea of the mode of culture and means of preparing the fibre. A loose, dry soil is selected, near a stream. The ground is well broken and manured, and laid out in beds eight yards long and one wide, which are carefully raked and watered one day, and the same processes repeated on the following day, preparatory to sowing. The seeds are then mixed with a little dry earth and sown broadcast, and afterwards the beds are swept lightly with a broom, covering the seeds and smoothing the surface at the same time. Matting is suspended on a temporary framework over the beds before the plant emerges from the soil for protection until the plant is two inches high, and this covering is watered every day and removed at night. When three inches high they are transplanted in rows four or five inches apart; watering is continued three or four times daily for the first ten days, when an occasional wetting suffices. At the approach of cold weather the field is covered with a heavy coating of manure for winter protection. In March the manure is removed and watering in dry weather resumed. In the third or fourth year, as is stated, the stems are ready for cutting, and sometimes in the second year. If grown from roots (cut in pieces and planted 18 inches apart) they are ready for cutting the second year, and after a plantation is established three crops per year are secured.

The stems are cut an inch from the surface; the first cutting occurring in June, and the last in September or October, the stems being six or eight feet high. After cutting, the plants are covered with manure and watered.

The first step in preparing the fibre is the stripping of the leaves by women and children; then the stems are soaked in water and afterwards broken in the middle, thus loosening the fibrous portion, when the finger nails are inserted between bark and stem, and passed from top to bottom, separating one-half the fibre. The remaining fibre, after further soaking, is taken off with a rudely made knife, with a blade about two inches long. "This rude implement is held in the left hand; its edge, which is dull, is raised a line above the index finger; strips of hemp (or fibre) are then drawn over the blade from within outwards, and, being pressed upon by the thumb, the fibrous portion of one surface, and the mucilaginous part of the other, are thus taken off. The hemp then rolls up like boiled tendon. After being wiped dry it is exposed to the sun for a day and then assorted, the whitest being selected for fine cloth." It is then bleached

by boiling and drying in the sun, when the tedious process of separating the individual fibres with the finger nails is dexterously accomplished by women or children, leaving the material exceedingly fine and soft; and afterwards a further bleaching is secured by soaking in water with a little lime, or the ashes of mulberry leaves. During the bleaching process the fibre must be dry, as moisture will give it a dark color.

CHINA GRASS FIBRES OF COMMERCE.

The China grass cloth has long been known to commerce, and the fibre was many years since brought to Europe, where it attracted the attention of manufacturers for its fineness, strength, and beauty. It was found to be stronger than hemp, with the lustre of silk. At the British International Exposition of 1862 several specimens from India, Assam, and Malacca were exhibited. The report of that exhibition referred to these samples as attracting more attention than any other products of India, and stated that late experiments had shown that the fibre was susceptible of manufacture in a great variety of useful and valuable fabrics.

At the same exhibition samples were exhibited bearing the name of *Boehmeria nivea,* a fibre believed to be identical with the *B. tenacissima,* of the same commercial value, although represented as botanically a different species. The plant flourishes at Darjeeling and other places in the north of India.

The Neilgherry nettle, (sometimes written Nilgiri nettle,) *Urtica heterophylla,* abounding in the hills of that name in India, possesses a fibre used for similar purposes, sold at the same price, and is sometimes included with China grass fibres. It has been called "vegetable wool," is abundant in a wild state, and it is assumed that its cultivation would be profitable. The bark of the young wood steeped in water twenty-four hours renders easy the separation of the fibre. The nettle is one of the most formidable of the stinging tribe—a fact which might militate against its utilization. The Technologist says that "the fibre is brilliant and strong, easily separated, regular in fineness, from 6 to 28 inches in length, of good natural whiteness, similar in fineness to the coarsest mohair, much twisted, generally flattened at the root end. The last peculiarity is a defect, otherwise it is a fibre perfectly adapted for spinning with coarse combing wools. It seems to be especially applicable for fabrics where bright stiffness is the quality desired. It dyes in a similar manner to China grass, but does not possess equal brilliance, strength or whiteness. If it were forced on the market it would immediately take a position as a combing fibre, probably second only to China grass. It is reported to be obtainable in abundance, but the plant is a formidable one to manipulate.

The *B. candicans,* of which seed has been imported from Paris by the Department, is thus characterized by Professor George C. Shaeffer, librarian of the Patent Office, a well-known expert in fibres, in a note to the editor of this report:

"The *Boehmeria candicans* was first brought to notice in England, at the exhibition of 1851, when, according to Royle, 'a prize medal was awarded for some beautifully white and silky looking fibre sent by the Singapore committee, from M. Weber, of Java, as the produce of a plant which he called *Boehmeria candicans,* and also *Linum usitatissimum'* [but this is the botanical name of our own flax] 'on the same label. The former is probably another name for our plant,' [he is speaking of the *B. nivea,*] 'as it is said to be the *ramie* or *ramee* of the Malays. The plant is cultivated by the Dutch in Java, and its fibre has been introduced into Holland, and gold medals awarded to Messrs. Meerburg, of Leyden, for specimens of sail-cloth, ropes, cables, &c., and also for some finer kinds of cloth and table-cloths. The plant producing this fiber was called

Boehmeria candicans and also *B. utilis* by Professor Blume, but it is probably only a variety of *B. nivea*, or perhaps a nearly allied species."

"From this it will be seen that the *B. candicans* is the plant, a specimen of which I have from Mr. Ballestier, gathered by him from a Dutch plantation in Java, and which he called *ramec*, and said was identical with the "China grass." This, if at all different from the *B. nivea*, is the plant cultivated by the Dutch in Java, named by Blume, and by him introduced into France. It is, therefore, the same as that "pushed" by Roezl, the Austro-Belgian botanist of Texas, which *he* says cannot be raised from seeds. But it is to be remembered that in his elaborate display of synonyms he omits this very one of *B. candicans*.

"Of course it will be worth while to carefully distinguish in the culture of this plant, and establish the fact whether it *can* or *cannot* be raised from seeds, and whether it is essentially distinct from the *B. nivea*. It should be borne in mind that it was shown in Holland mostly in the form of the coarser fabrics."

MANUFACTURE OF GOAT FLEECE.

Mr. Israel S. Diehl, formerly United States consul at Batavia, in Java, the writer of an article on "the goat," in the report of this Department for 1863, was deputed by Hon. Isaac Newton, late Commissioner of Agriculture, to visit Europe during the past year, and, among other duties, to investigate the manufacture of Angora or Cashmere fleeces, with reference to its introduction into the United States.

The acclimatization of these goats in this country is an established fact. For several years, in different parts of the Union, the Angora goat has been bred, both pure and crossed, with our native goat. Far from deteriorating by the transfer, as had been predicted, it is found that in some parts of the country even the unmixed breed of the imported goats has shown evident signs of improvement resulting from the change. This branch of pastoral industry has begun to assume very considerable prominence, as is indicated by the fact that during the past year not less than $100,000 has been paid for these goats in Ohio alone.

In order to test the quality of the fleeces produced in this country, Mr. Diehl, prior to his departure for Europe, collected specimens from different flocks and localities from Massachusetts to California, and subsequently compared them with foreign fleeces at the Paris Exposition and elsewhere, both in Europe and Asia. His own deliberate opinion is that in fineness, delicacy, and beauty the American fleeces were equal, if not superior, to the choicest oriental specimens met with. On the subsequent exhibition of these samples at Paris and Roubaix, in France, and at London and Bradford, in England, the manufacturers expressed the most delighted surprise at their beauty and facility of manipulation, pronouncing them fully equal to the best imported Asiatic fleeces. As a result of the exhibition of these samples a rapidly increasing demand for American fleeces may be expected. But shall we confine our industrial enterprise to the mere production of the raw material, leaving to the overgrown manufacturing systems of Europe the monopoly of the higher processes of art in which are elaborated those beautiful fabrics; those shawls, camlets, mohairs, &c., which have become so celebrated? Shall we not rather secure the economical advantages of a varied industry by building up a system of manufactures which, co-working with our agricultural enterprise and absorbing its production, shall at the same time give fresh scope to that wonderful inventive genius which has characterized even the infancy of American art? It was to solve this problem that Mr. Diehl was sent on this important mission, and it must be acknowledged that he has contributed many important elements to the solution.

As an essential preliminary to his observations abroad, he visited the principal manufactories of wool and worsted in this country, in order to acquaint himself with our actual facilities for working up the fleece. He found very little machinery adapted to its fabrication, and neither workmen skilled in the processes of manufacture nor capitalists at once willing and qualified to engage in the necessary financial enterprise. Manufacturers, however, expressed the warmest interest in his mission, and high hopes of its abundant success.

The manufacture of goat's fleece in the United States is by no means a novelty, however. Many years ago it was imported from England and from Asia to be fabricated into military and fancy goods, selvages, &c. But the high prices of the fleece, with the cessation of the demand for selvages, caused this incipient manufacture to decline and disappear. It has revived to some extent, however, within the last few years, since the introduction of the Angora goat into this country.

ANGORA GOATS.

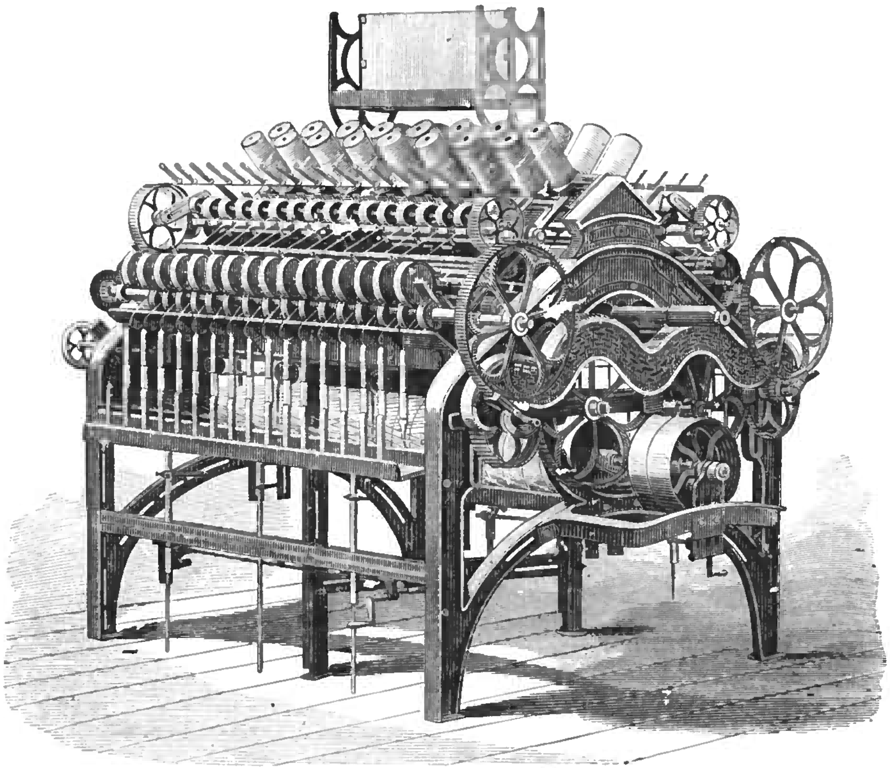
It is stated that most of last year's clip was sold on commission by a single New York wool house. Three manufactories have provided machinery for its experimental manufacture. These parties ventured to pay for fleeces, varying from three quarters to pure breed, from 50 cents to $1 50 per pound. The goats shear from two to eight pounds each, according to blood, age, and size; hence it is far more profitable, even at these experimental prices, to raise goats' fleece than sheep's wool. The establishment and extension of this manufacture cannot fail to stimulate its increase and secure its permanency. For combed and washed fleece, suited to fancy work, much higher prices have already been realized. Skins of yearling weathers, from $\frac{7}{8}$ to $\frac{15}{16}$ pure breed, have been sold at $18 apiece

Having ascertained our manufacturing deficiencies, Mr. Diehl next visited the Paris Exposition, where he directed his attention to the fabrics of various kinds of goats' fleece. He was astonished and delighted at the extent, variety, delicacy, and exquisite beauty of the specimens contributed by the looms of Asia Minor, India, France, England, Germany, and other countries represented in this department of the Exposition. These manufactures consisted of shawls, camlets, challis, mohairs, poplins, velvets, delaines, hosiery, yarns, gowns, robes, rugs, fur trimmings, tassels, &c. Some of them were made of pure goats' fleece, and others of the fleece mixed with wool, cottons, silks, and other fibres, imparting to these compounds a lustre, strength and durability which no other fibre except silk will secure. Nearly every nation represented at the Exposition presented some beautiful manufactures of goats' fleece. India, England, France, and Austria seemed to excel in the more delicate fabrics, while Turkey exhibited the greatest variety and richness of the raw material.

In England the manipulation of this staple is practically monopolized by a few parties, who appear adverse to imparting any information in regard to the manufacture and sale of their fabrics.

The fleece manufactured in England is mainly produced in Asia Minor from the Angora goat. It is imported to the extent of 3,000,000 pounds per annum, and is known in commerce by the name of mohair. The annual importations from Turkey for the sixteen years from 1843 to 1858, inclusive, were as follows:

	Pounds.		Pounds.
1843	575,513	1851	193,046
1844	1,290,771	1852	222,239
1845	1,241,613	1853	2,916,509
1846	1,287,320	1854	1,189,147
1847	1,300,000	1855	2,028,411
1848	88,853	1856	2,912,838
1849	253,037	1857	3,255,010
1850	267,650	1858	3,312,012



SPINNING FRAME.

PLATE XIX.

Messrs. Hughes & Ronald, wool brokers of Liverpool, in a recent report, thus speak of this Angora fleece:

> The importation of mohair is of comparatively recent date, and it is scarcely a quarter of a century since it was introduced into this country. It was, for some time, chiefly used for the list ends of woollen cloths and commanded little attention; but for some years past it has been greatly gaining in favor for the fancy trade, and has now become an article of considerable importance, our annual import being upwards of 3,000,000 pounds weight. It is particularly adapted for damasks, velvet for coach linings and curtains, and ladies' dresses, mixed with cotton and silk, and produces a most agreeable texture. A large quantity of the yarn spun in this country is exported to France and Germany, where it is chiefly manufactured into velvet. The fashion has this year run much upon mohair for ladies' dresses, * * * * and every thing on the spot and for arrival has been bought up for home consumption.

The market price of this fleece (for wool it cannot be called with any propriety of language) varies from three to four shillings, or from 75 cents to $1 per pound, gold value. The demand is permanent and increasing; and it will continue to increase until met by a vastly more copious production. The present extraordinary demand results partly from the attempt of the English monopolists to absorb the entire production of Asia Minor, by sending agents over the whole country to secure the clip as soon as it is sheared. The prices of a few inferior lots in the oriental market are no criterion of their real value. The quotations in Asia Minor are in some cases fully equal to those in England, leaving no margin for export and import duties, cost of transportation, profits, &c. These fictitious prices, it is easy to see, are maintained by collusion in order to discourage operations by outside parties, while the mass of the clip is quietly taken, at very reduced prices, from the shearers, who are blissfully ignorant of telegraphic or newspaper prices current reports.

The supply of Angora fleece in Asia Minor is limited and precarious. Access to it is both difficult and dangerous, from the jealousy of the government and the barbarous bigotry of the people. The vigilant care and formidable power of the English government protect the agents of the above mentioned monopoly in their efforts to secure the clip of Asia Minor; but the stereotyped character of Asiatic industry gives no reasonable promise of an enlargement of the supply from this quarter; hence English and continental manufacturers are looking to the Cape of Good Hope, Australia, the United States and South America for an increased production of this staple to meet their necessities. The value of this entire interest would be enormously enhanced by the opening of an adequate and permanent source of supply.

In Europe the fleece is spun into yarn, mostly in England, or at Roubaix in France, and thence distributed over Europe for manufacture into cloth. The excellence of the yarn spun in England and at Roubaix is due partly to superior skill, partly to peculiar and improved machinery, and partly to natural and artificial atmospheric humidity. This latter element, if not absolutely essential to success, is at least very desirable.

From very transparent motives the process of spinning has been represented by those in the interest of the monopoly as very expensive and difficult, nay, even a profound secret, known only to those now engaged in the business. But these representations were flatly contradicted by the exhibition at Paris of a great variety of machinery for carding, scrubbing, spinning and weaving the tiftik or Angora fleece. This machinery, purporting to have been made largely in Bradford and Roubaix, two great seats of yarn production, entirely exploded the assumption.

A specimen of this spinning machinery, manufactured by J. J. S. Smith, Low Bridge Works, Keighly, Yorkshire, is given in Plate XXVI. These machines are sold at prices varying from $100 to $300, according to the number of spindles. John Leeming & Son, North Holme Mills, Bradford, Yorkshire, manufacture spinning and other machinery for working up this tiftik fleece. Leon Morel,

of Roubaix, France, exhibited a rotary combing machine which worked remarkably well. This machine was held at $1,600.

This establishment is the largest in France for manufacturing the fleece, claiming to work up 140,000 pounds per week. Rawson and Amedie Prevost manufacture at Leicester, England, and Roubaix, France, combing machines, patented to the senior partner, at prices varying from $2,000 to $3,000.

For the fabrication of the fleece abundance of machinery was found in England, France, and Germany. John Leeming & Son, at Bradford, Yorkshire, erect all kinds of machinery demanded by the various processes of the manufacture. Robert Hall, at Bury, near Manchester, constructs a variety of machinery, and sells a very good light machine at $85. Snowden & Stevenson, at Bradford, manufacture looms for working up all kinds of the fleece, at prices varying from $90 to $100, making 50 yards of cloth in 10 hours. William Smith & Brothers, at Heywood, near Manchester, also manufacture such machinery. N. Berthelot and E. Buxtorf, at Troyes, construct machinery for the manufacture of hosiery. The former sells for $2,000 a machine that knits 18 pairs of socks per day. Smaller machines sell for prices ranging from $350 to $650 each, producing a very fine article of hose. Among the cards of houses engaged in the different branches of this manufacture, collected by Mr. Diehl, the following are selected: Talbons and Renevey, Paris; J. Gay, Paris; Prieur Herault, Paris; Parillet & Pavie, Paris; H. Monton, Paris; Tresca, Carlet & Daird, Paris; Adam Wade, Wakefield; P. Ollier & Son, Manijols; Lewis Bollman, Vienna; Julius Wolfner & Co., Pesth. The manufacture of hosiery is represented by F. Boncheron and E. Buxtorf, of Paris; while Berington & Morris, London, F. Witzleben, Leipsic, and Pansier-Kaiser, Brussels, give special attention to the manufacture of goat skins into robes, furs, rugs, &c.

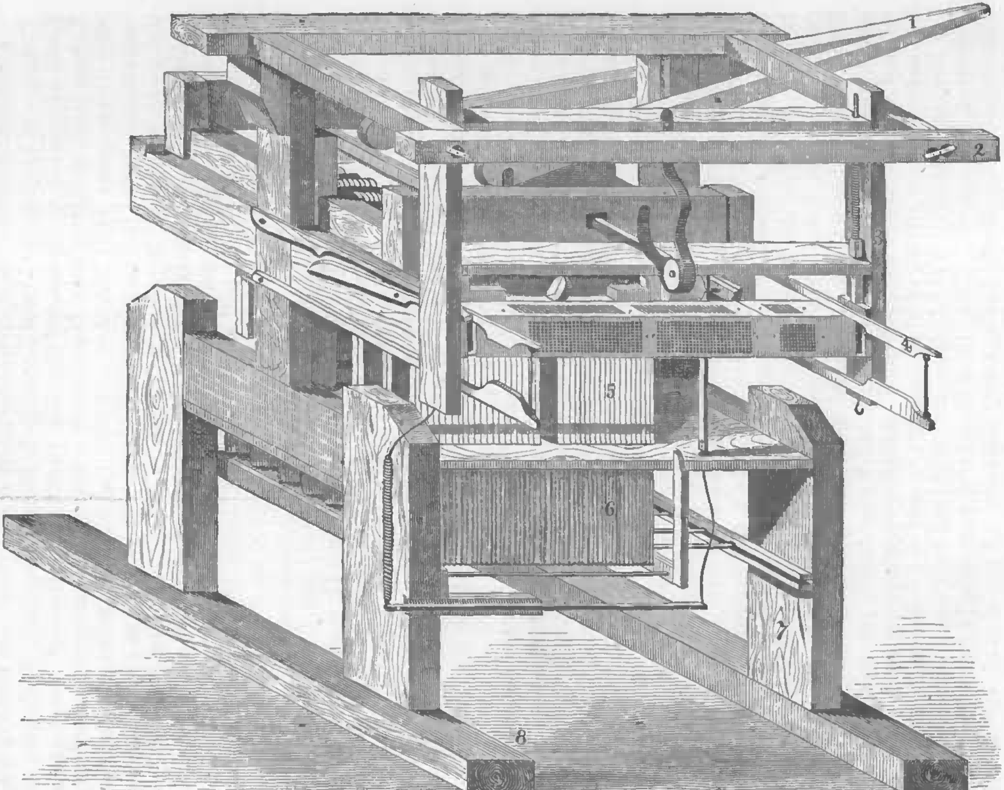
The leading machine in Europe for the weaving of goats' fleece into shawls is the double Jacquard loom, manufactured by Willibald Schrane, of Vienna, Austria, a drawing of which is given, Plate XXVII. From a highly eulogistic notiec of this machine by the "Lower Austrian Industrial Society," at whose rooms it was exhibited, it appears that it is furnished with a double cylinder for ornamental patterns suited to double stuff weaving, and other arrangements by which precisely the same figure is wrought on both sides at once.

By this loom are manufactured some of the finest specimens of shawls, which were purchased in considerable quantities by New York merchants at the Exhibition. It is worked by hand, and shawls are made by it of remarkable beauty and cheapness. Mr. Schrane furnishes a loom with a Jacquard improved machine, suited to the manufacture of the finest shawls, with design cards and cashmere chains, and delivers it properly packed at the railway station for about $200. He will also furnish a skilled workman to come to this country to erect and work the loom, producing two or three fine shawls per week, for a weekly stipend of from $10 to $15, provided travelling expenses are paid. Mr. Schrane has manufactured 10,000 of these machines, and is producing from 400 to 500 per annum. About 1,000 of these are employed in Vienna alone in the manufacture of fine shawls. They have also been successfully introduced into Constantinople, Asia Minor, India, and Cashmere. They should be immediately introduced into this country to meet the demand of our rapidly growing fleece production. The presence of such manufacturing facilities will greatly stimulate our production of the raw material.

Among the prominent shawl manufacturers in Europe may be named, H. Lawatch and Isbary, of Vienna, employing several hundred looms in different parts of the city and its vicinity, and Duché & Co., Paris, whose specimens are remarkably close imitations of the real Cashmere shawls.

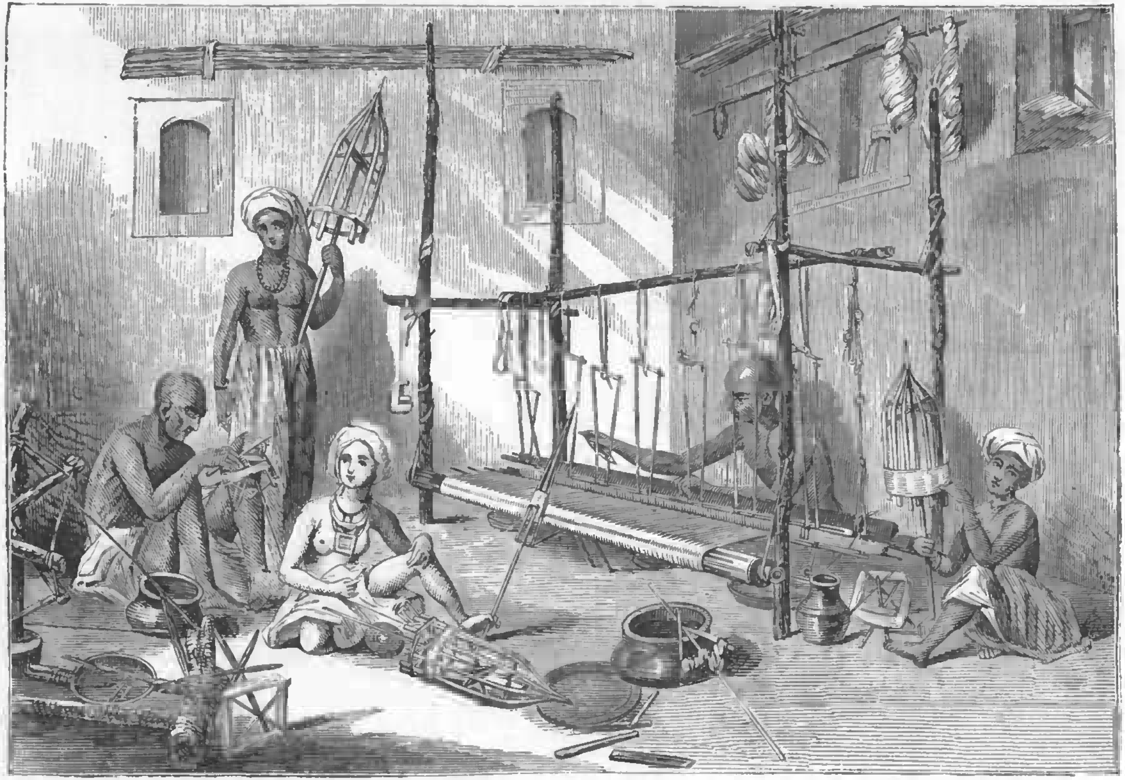
Having completed his examination of the European manufacture of goats' fleece, Mr. Diehl proceeded to Asia by way of Constantinople. In the bazaars

PTATE XX.



DOUBLE JACQUARD LOOM.

PLATE XXI.



WEAVING IN INDIA.

of that famous metropolis he saw a very handsome display of fabrics of this staple from the looms of Turkey, Persia, and the east.

The principal seat, both of the production of the raw material and of the manufacture of this staple in the Turkish empire, is Angora and vicinity, in Asia Minor. Here were once in operation from 1,700 to 1,800 looms, working up the tiftik fleece, chiefly into camlets, hosiery, and fancy dress goods. But this industrial activity, like that of Cashmere, has passed away. A few hundred looms, where once were as many thousands, now struggle hopelessly against the fatal competition of European machinery and the aggressive policy of European governments. The fleece is exported to Europe for fabrication, thus rendering the Orient tributary to that industrial monopoly, which would absorb the entire manufacturing industry of the world, and render all other nations mere producers of raw material. The national politics of these Asiatic peoples, after having survived the revolutions of all past history, seem now to be afflicted with a sort of dry rot, and to be crumbling in hopeless decay. The industrial systems are being rapidly subverted by European craft and by the resistless course of events. The delicate processes of modern machinery surpass even the quaint and exquisite skill of oriental operatives, while in accuracy of design and cheapness of execution there is a still greater difference. This enables the European manufacturer to purchase the raw material of Asia Minor, to pay export and import duties and transportation expenses, and then to undersell the Asiatic fabric, forestalling its entire western market.

Mr. Diehl visited Angora, and examined the looms and processes of manufacture in use among the natives. These he found to be exceedingly crude and simple. The fleece is first taken to a running stream, where it is washed by hand and trampled under foot in the water. It is then spread upon the sand to dry and bleach, after which it is assorted according to fineness, length, and purity. It is then hackled on a simple old-fashioned hackle, consisting of a few dozen long iron nails driven through a board. After hackling, the fleece is placed in bundles or rolls and spun into yarn, mostly by the women and children. For this purpose a common distaff is used, or a stick from 12 to 18 inches in length, with cross pieces, rendering it about equivalent to a large spool. It is then ready for the loom. This instrument in Angora is of the simplest and rudest construction, and of the same unvarying type that has been used by countless generations. Asiatic industry is frugal in labor-saving processes; when once machinery is brought to such a degree of efficiency as to render it barely possible for an unlimited amount of labor to supplement and supply its deficiencies, no further improvement is made. Men then subject themselves, their minds and muscles, to a training which makes them almost a part of the machines they operate. Caucasian mind seeks to emancipate itself from all unnecessary labor by transferring it to machinery, thus leaving the mental faculties free for intellectual labor. Each of its tasks it devolves successively upon inanimate matter, while it continually ascends to higher results. But this function of intelligence seems to be entirely ignored by Asiatic mind and Asiatic art.

The Angora loom, of which engravings are presented, consists of two upright posts, from four to six feet apart, planted in the ground and running up through the floor (if there be one) to the roof of the house. Near the top of these posts a cross bar is rudely fastened, often with ropes, from which the simple weaving apparatus is suspended by pulleys and worked by treadles. These are located beneath the level of the floor, on the edge of which the weaver is seated. The woven cloth, passing round a roller in front of the weaver, is then drawn by weights over another roller above his head. These looms cost from \$5 to \$25, some of them being ornamented with rude carving.

The ordinary expense of a loom is given at \$20 per month. A number of these looms are strung along the sides of the house, some houses containing as many as 20 looms.

The process of weaving is necessarily tedious and expensive. Workmen ask higher wages than the weavers of England and France, and accomplish much smaller results. Angora weavers modestly summed up their demands as follows: passage paid to the United States, house rent, board, and $25 per month; the English, French, and German weaver works for from two to five shillings per day, and pays his own expenses.

The manufacture of Cashmere, camels' hair, and other shawls, once so flourishing in Asia, is greatly impaired, and, in many places, entirely discontinued. But few of the once famous Cashmere shawls have been manufactured since the rise of the fatal competition of Lyons, Paris, Paisley, Vienna, and other manufacturing centres in Europe. Caucasian capital and skill, aided by the elaborate contrivances of machinery, can now produce, at much lower prices, fabrics as delicate and beautiful as the famous Cashmere shawls, though, doubtless, not so durable. The immediate introduction of this shawl weaving into the United States is perhaps impracticable, though its final success here is but a question of time. The obstacles to be overcome are lack of skilled labor, of machinery, and of an active home demand for fabrics of goats' fleece. None of these, however, are very formidable. Sufficient labor and machinery can be imported to meet present necessities, while the ready intelligence of our workingmen and the profound and subtle genius of our inventors may be relied upon to surpass, very soon, our imported models. The increasing taste and luxury fostered by the rapidly accumulating wealth of the American people, and the enormous reduction in the cost of manufacturing this beautiful staple from the fancy prices hitherto commanded by oriental manufacture, will soon create a permanent home demand. This will give a comfortable support to a large industrial population, and assist in arresting the increasing drain upon our circulating medium caused by large importations of manufactures of wool, cotton, silk, and flax—a matter of no small importance in the present financial condition of the country.

WATER FOR DESTITUTE REGIONS.

By D. S. Curtiss, Madison, Wisconsin.

The absence of brooks and springs from our broad prairies is really no objection to settling and making residences on them, nor is it any cause for depreciating their intrinsic value. A cheap substitute for wells may be easily obtained and be more pleasantly enjoyed, at even less cost. Some portions of what is here given was published by the writer in the Wisconsin Farmer of 1863; his leading object being to induce settlement and promote comfort upon the vast and fertile prairies, south and west, from which many people are kept away by a cry of "no water." The subject is an eminently interesting one, deserving of far more attention than it has hitherto received, and I have frequently wondered that it has not commanded greater consideration.

EFFECTS OF PURE SOFT WATER.

Beautiful is water, and rich in health, vigor, and pleasure, and the effects of an unstinted supply on the enjoyment of a people are hardly calculable—certainly not adequately appreciated—unless when we are once deprived of it. Where good water is scarce, or procured only at considerable cost, those habits

PLATE XXII.

LINCOLN EWE.

Bred by T. MARSHALL, Branston, Eng Girth, 6 feet, live weight, 364 lbs. dead weight, 67 lbs. per quarter. Averaged 15 lbs. of wool per annum.

of cleanliness, so necessary alike to good health and morality, are too much neglected; nor will such supply be furnished to animals as will enable them to afford the full and natural product of flesh, fleece, milk, or efficient service. If we have never observed the beneficial results of using soft water for all purposes, we cannot appreciate its value; those persons who have seen its effects and understand its value could hardly be induced, by any means, to dispense with its regular use for either drinking, cooking, or bathing. It is well known that very frequent bathing of the whole person is conducive to health, strength, and comfort; but it is particularly so on the vast prairies, where there is so much more exposure to sun, wind, and dust, than in wooded and shaded regions. This consideration is too much neglected, and cannot be too earnestly impressed upon the minds of those so situated.

DISTRIBUTION OF BLESSINGS.

Many persons, aware of the apparent destitution of water on the prairies, have been deterred from settling upon them; hence, extensive and fertile regions remain closed to thousands who otherwise would speedily settle them, and make productive farms in every direction, adding strength to the state, and enriching themselves. But they are mistaken in their views, as a thorough trial would show; the difficulties so frightful to their imaginations not really existing.

Providence, in dispensing physical blessings to his creatures, graciously observes a system of checks and balances, compensating for a deficiency in one case with valuable advantages in another. The absence of timber, for instance, is compensated by extensive and fertile fields, ready for the plough and the harrow. The cost of cisterns, basins, and ditches is offset by relief from the heavy labor and dirty work of chopping, logging, and burning off heavy timbered lands; while the want of running water and handy wood is more than made up by freedom from the vexations, toil, and difficulty of ploughing and working for years among stumps and roots, subject to constant accidents in breaking of tools, with the consequent hindrances and expenses.

But, as I have said, the lack of water is only imaginary. Although there may not be on the surface the bubbling spring and running stream, yet there is a bountiful resource within the reach of every family and farm owner, which is capable of affording even a more convenient and healthful supply, and at less expense than is incurred by those inhabiting regions containing streams, springs, and ponds—that is, *rain or cloud water*.

Failing to take a broad and rational view of all the facts and resources, many people have regarded this lack of springs and brooks in those regions so richly capable of feeding millions, as a kind of oversight in Providence. To have spread out to the view of man such vast and inviting tracts of land, upon which easy toil might win wealth in unlimited measure, and yet to have withheld so indispensable a requisite as water, would indeed seem strange and unaccountable, and with no remedy would be cause of regret. But to the thoughtful observer no such deficiency exists. During the different seasons of the year abundant rains and snows fall upon all these regions, to supply all needed water, as several years' residence in Michigan, Illinois, and Wisconsin fully prove; though a less proportion of snow falls here than in some other sections of the United States.

PROOFS BY THE RAIN GAUGE.

Observations by rain gauges, recorded for several years, at different stations on the great lakes and the Mississippi river, show that the average depth of water which annually falls on the whole surface of that belt of country, between Saint Anthony's Falls, north, and Vicksburg, south, the central portion of the

United States, is about 2½ feet—a vast quantity of water, indeed; and, did it not regularly pass off in currents, absorption and evaporation, it would soon inundate the entire country. In some seasons as many as six or seven inches' depth of water falls on the surface of this region in a single month. This large quantity of water showered upon the splendid prairies is a beautiful and a blessed spectacle, as delightful to contemplate as to enjoy. And with less labor and expense than the cost of most wells, it can be secured by the inhabitants, for constant and convenient use, at any desirable places upon their premises.

ROOFS AND CISTERNS.

I will now point out some of the many modes by which parties interested can collect and retain as much cloud-water as they may need for home and farm use, at comparatively small cost and trouble.

But first, a more definite idea of the quantity of water which annually falls may be formed by considering the fact that over 400 hogsheads of water fall upon the roof of a 30 by 40 feet barn; enough to furnish drink for a large stock the year round, though they get none from any other source. A hogshead holds about 64 pailfuls, and 400 hogsheads about 25,600 pailfuls. Allowing four pailfuls a day to each animal, (a liberal allowance,) this quantity will afford drink to 20 head daily the year round, or to 6,400 head for one day. But there are some months in the year, in the dryest places, where stock can get water from low spots in the fields without recourse to the cisterns, so that more than a score of cattle and horses can be conveniently supplied with the most wholesome drink by the water which falls on the roof of an ordinary barn, even in dry localities, rendering wells and streams comparatively unnecessary. I need hardly say that it will not be necessary to have cisterns large enough to hold all this quantity at once, as it will be drawn out from time to time as needed between the rainy seasons. A cistern at the barn to hold 100 hogsheads would be amply sufficient for the cattle. Each one will make his own calculations, and arrange for himself as circumstances may demand.

The following general statements will afford sufficient practical data upon which to proceed in calculating the dimensions and capacities of cisterns. A hogshead is about 8½ cubic or solid feet. A hole or cistern two feet two inches square and the same depth will hold one hogshead of water; one twice that size and depth will hold eight hogsheads; one eight feet each way will hold 62 hogsheads; one ten feet each way will hold 120 hogsheads. A round cistern or well four feet in diameter and six feet deep will hold over 46 hogsheads of water; one of the same diameter and nine feet deep will hold about 55 hogsheads; one 12 feet deep, same diameter, about 93 hogsheads. The foregoing form a convenient basis from which to calculate. By a little digging and plastering in low spots and basins in the field, considerable quantities of water may be collected and retained after showers, for days and weeks, for stock to drink, without drawing from the permanent cisterns, until their contents shall be more needed in the dryest times and in winter. These field basins, of course, can be made more or less capacious and durable, according to the judgment of the farmers. Very cheap ones, even, will answer a useful purpose for a season.

As incidental to this subject it is pertinent to allude to another mode sometimes resorted to for supplying water, as well as to improve the productiveness of the land, making it warm, dry, and mellow, that is, *under draining* wet, heavy places, with "mole ditches," or blind drains, leading the water to the low spots. Some operators have been much and happily surprised by unexpectedly obtaining a moderate supply of water by this thorough under draining with "mole ditches," leading off into larger open ditches, and thus quite permanent rivulets are formed in ravines where previously no water appeared. This is from the fact that many fields are saturated with cold water at two or three feet

depth, rendering these seemingly dry fields cold, sour, and hard, producing only stinted and sluggish vegetation. This substantial under draining changes this character of the soil; the operation affording a double benefit, improved soil and supply of water. But permanent cisterns must be the great and general reliance where running water is not to be had, and, all things considered, they are the cheapest and best, even where creeks and wells are accessible.

COST OF CISTERNS VS. WELLS.

Substantial cisterns, of sufficient capacity to receive this roof water, can be constructed at considerable less expense than the cost of most wells in the country. Cisterns need not be so deep as even the shallow wells, rendering it much more easy to draw the water. Wells must be sunk at particular places where there is a prospect of getting water, often not the most convenient, while cisterns may be made wherever taste or convenience dictate, under the buildings or beside them.

Every good farmer has at least one good house and barn, from the roofs of which two or more cisterns may be constantly filled with good, wholesome water, at less cost than the cheapest wells.

In many localities I know of wells 50 to 150 feet deep, which cost one, two, and even five hundred dollars, and, after all, are capable of furnishing only a limited supply of water, raised with much labor and trouble on account of great depth; while in any locality good and ample cisterns, at the house and barn, can be made at a cost of $20 to $50, which will constantly afford a full supply of soft pure water for all purposes, at slight depth and easy draught, and conveniently under cover—in pleasant contrast every way with the tugging draught and scantiness of deep wells, and weary walks in mud or snow to the distant springs and brooks.

In some instances, on the prairies, I have known the rain water to be collected in cisterns or reservoirs a few feet above ground, and drawn off through faucets or spouts for sheep washing, which is done much better and more pleasantly with this soft water than with the hard water of streams, and with more comfort to both washers and sheep, while the sheep are not dirtied by being driven over dusty roads to their pastures. Another benefit is realized from this operation: the water being carried off, after washing, to irrigate the garden or other grounds, is found to be highly fertilizing. Altogether it is a matter well worthy the attention of sheep-growers.

The roofage of a good dwelling will usually collect about as much rain-water as the barn roof, portions of which, if desired, may be collected in a reservoir in the upper story, for convenient use in bathing tubs, &c. Cisterns at the house, for drinking and culinary purposes, should be deeper and narrower than at the barn, say 10 to 12 feet, (not a great depth from which to raise it,) that the water may be cooler and settled better. They should also be divided by partition walls through the middle, made of soft porous brick, without mortar, and with some style of filter near the bottom—there are various modes of making them cheaply—through which the water may all pass before being used. Into one of these apartments the water should be conducted from the eaves, but should be drawn out as used from the other; the one into which the water falls being a few inches deeper, that all impurities and sediment may settle to the bottom, and not be allowed to get into the other apartment, by which process there will always be clear water for use.

Some gentleman experienced in the construction and use of cisterns commucates an excellent article on the subject to the Germantown Telegraph, from which I make the following extract:

The tub is entirely unnecessary, and will cost more than thrice as much as the labor and material to cement the cistern in the best manner, plastering on the ground, which is the best and cheapest mode of making cisterns water-tight. One coat is sufficient if the cement

is good and the mortar well mixed. I have used every variety of cement, more or less, for the past 25 years, and for many purposes, and with sand of all qualities. So much depends upon both cement and sand that I cannot direct any certain proportion of either to be used, unless I can give the material a practical test. I have used mixtures of one-fourth cement to three-fourths sand that made better mortar than some other qualities of cement when using equal proportions of both; so that I am governed more by the working of the material when well mixed, by its tenacity, readiness to slip off the trowel, and quickness to set, than by measurement on proportions of the two substances without the working test. I measure each and test the mixture till I find the proper proportion, then continue to use those proportions. I find that a coat of good cement mortar directly on the earth, one quarter of an inch in thickness, is generally better than greater thickness; if too thick it is liable to crack in drying and settling. It is sometimes necessary to add two coats of mortar where spots of the earth wall are softer, by removal of stones or roots, &c. In cases of cracks I mix a thick wash of cement and sand, and apply it to the cracks with a brush, and always with success. To make good cement mortar the sand and cement should be thoroughly and carefully mixed and incorporated before any water is applied; and as soon as practicable after it is wet it should be used. Cement work should not be exposed to frost for at least 90 days after being used, as freezing would destroy it before it is thoroughly set.

To return to the qualities of rain water. A distinguished physician, who has long and carefully tested the subject, writes thus:

Hard water for cooking is decidedly bad. Many vegetables are nearly spoiled by being cooked in it; and it is difficult to get a good infusion of tea or coffee in hard water. The water used in the city of London requires full one-fourth more of tea or coffee to obtain an infusion of equal strength than that obtained in soft water, while the flavor is decidedly inferior.

Experienced tasters can readily distinguish tea or coffee made with soft water, from its richer flavor and greater strength. Then it is well known that apothecaries cannot make good tinctures or decoctions with hard water, but always use soft or distilled water. Tea kettles and other cooking vessels do not get coated and filled up with lime or other deposits when only rain water is used—a noteworthy and a very agreeable consideration to cooks and tidy housekeepers.

Those who have become accustomed to drinking rain water from clean cisterns like the taste of it even better than well water; and after a little season of using the water drawn from these deeper cisterns it is found to be sufficiently cool and palatable, quenching thirst more satisfactorily than colder water; at least such is the experience of the writer and many others.

The most important and interesting argument, however, in favor of the habitual use of cloud water, next to its being accessible where no other water exists, is to be found in its healthfulness. Rain water is both a restorer and preserver of health, as well as a preventive of many diseases. This important fact will not be unheeded by the wise and thoughtful in arranging and furnishing comfortable and tasteful dwellings, whether in city or country, in destitute or watered sections, in shop or stable; for in this respect, as well as for convenience, it is everywhere alike valuable and pleasant.

CHOLERA AND SUMMER COMPLAINTS.

It is a well established fact among intelligent medical men, that the stomach and bowels are far less liable to derangement and disease, to attacks by epidemics, under the uniform use of rain water than of hard water. This is confirmed by numerous medical and scientific reports in different countries.

During the cholera seasons of 1848 and 1850 the writer had opportunities of seeing this fact pretty clearly demonstrated. He spent considerable portions of those years in different places along the Mississippi river; and especially in one of the cities on the banks of that river, one portion of which lies on the low flats under the bluff along the river's edge, and the other portion is located high above on the rocky bluffs, where it is almost impossible to dig wells and reach water; consequently a resort to rain water and cisterns is the only alternative to secure water for all purposes by the inhabitants. The result was that scarcely

a case of cholera, fever or diarrhœa—not a single fatal one—occurred among the residents on the bluffs, nor of summer complaints among children; while in the lower town, where earth water was almost exclusively used, those diseases raged with fearful fatality, sweeping off old and young by scores; and the facts were so marked that many persons removed to the upper town on the bluffs.

With great unanimity, medical reports, from different countries in regard to cholera and like epidemics, state that attacks were rare, and still more rarely fatal, in families and communities which used only rain water for all purposes, even in the most severely afflicted localities of both Europe and America; while these epidemics were as uniformly fatal among those who used only earth water; so that the conclusions are unmistakable and important that rain water prevents while earth water provokes epidemic attacks. A French commissioner of health, writing upon this subject some years since, said:

> It has been clearly ascertained, both in Paris and elsewhere, that rain water is a prophylactic (antidote) to cholera; and that the disease was not proved an epidemic in any city where rain water was exclusively used.

And he goes on earnestly to recommend "to all communities the general use of rain water, at whatever cost it may be secured."

Dr. Hobbs, of Memphis, reports as follows:

> By "the exclusive use of cistern water, cholera will speedily disappear and not return. This is known from both analysis and experience of over twenty years," and he consequently recommends "that it should be used faithfully for all personal purposes."

John Lea, of Cincinnati, writes as follows:

> It is a verified fact, which will stand the test of the strictest investigation, that the exclusive using of rain water for all purposes of drinking, cooking, and bathing, instead of hard or well water, is a sure preventive of cholera and bowel complaints, and that no town or city supplied exclusively with rain water ever suffers seriously from epidemic cholera.

From this united testimony, which might be greatly extended, it is unquestionably true that the exclusive use of rain water is especially a preventive of epidemics and generally conducive to good health. Enough has been presented on this head to secure the attention of intelligent and interested readers to the importance of the subject, and to show that it is for their highest interest to supply sufficient cisterns to secure all the rain water they may need for personal and household purposes, at any expense within their reach. Though plenty of earth water may be ready at hand, still, in the long run, the pecuniary saving by immunity from sickness and doctors' bills, with loss of time, will more than compensate for the expense of cisterns, to say nothing of the pleasure secured or the suffering avoided by its use.

SUFFERING ON THE PRAIRIES.

In years past I visited and spent considerable time in portions of the western and southern prairies, and witnessed the inconveniences and sufferings of the people in those beautiful regions, caused by the general scarcity of water. It was sparingly used in washing either person or clothes, and never for bathing; while animals absolutely suffered, and even died, for want of drink; and those which survived exhibited but sickly, sluggish growth, making little or no thrift during a whole season. Nearly or quite all of this suffering and loss might have been prevented on each farm at a cost of not more than the value of one good animal, if it had been judiciously expended in making cisterns and temporary basins in the fields to collect the rain water, which falls in sufficient quantities all over the prairie country to supply these wants, when seasonably taken advantage of by the inhabitants. Here is one of the admirable and peculiar advantages of cisterns, that they can be made and used in any desirable spot with certainty of water, while great care and skill must be exercised in selecting the place for sinking wells, together with the uncertainty of finding permanent water, even in favored localities. The cistern pump may be in the barn, where water can be

drawn and used, away from the wind and storm, with comfort to man and beast even in severe winter, for watering animals, preparing feed, and washing harnesses, carriages, &c.; exempt from the tedious task of going through mud or snow to the creek or pond. The same advantage is afforded in regard to drawing water for the wash-room and kitchen.

SAFETY AGAINST LOSS BY FIRE.

The safety of house or barn is also promoted by these cisterns, so conveniently near, from which water can be obtained at the moment when the fire occurs. Very often a single pailful at the commencement would extinguish the flames, which from a very short delay might become uncontrollable. In all localities where farming can be carried on, or a residence is desirable, cloud water can be secured at a reasonable cost for all ordinary purposes. Indeed, I have been told, by good authority, that insurance companies will insure farm buildings at much lower rates in cases where this wise provision for water is made. In fact, the saving in cost of insurance will nearly or quite pay the expense of the cisterns, &c., while a feeling of security is a pleasing consideration.

CONCLUSION.

In the foregoing pages I think it has been conclusively shown that the absence of running water is no valid objection or hindrance to making pleasant homes on the prairies, or indeed in any locality where there is good land. On the contrary, I think it has been shown that this apparent destitution of water is, in some respects, a blessing, as it will induce or drive people to adopt that which is greatly for their advantage, the use of water from the clouds rather than that from the earth, which has become vitiated by impurities from its surface, and absorption of deleterious mineral substances in its passage through it. Therefore, let no one be deterred from making a home upon the prairie, for he will not only find good health, but its beautiful plains and fertile soil will afford a rich supply of the necessaries and luxuries of life, and bring all the enjoyments of independence and abundant wealth.

FARMERS' CLUBS.

By Rufus Nutting, Randolph, Vermont.

Among the efficient means of increasing interest in agriculture, farmers' clubs or lyceums have occupied considerable space within the last decade. Although of comparatively recent origin, and confined to a few localities, their influence has been extensive and useful. The New York State Agricultural Society originally, in 1792, partook of this character, but soon expanded into a State institution. The American Institute Farmers' Club is probably the oldest permanent institution of the kind in this country, and the most influential. I am informed that it was organized in 1840, by Mr. Wakeman, and was modelled after some he had seen and admired in Europe. It holds its meetings every Tuesday afternoon, and a summary of its conversations and correspondence is published in some ten or more of the leading city papers, and eagerly read by hundreds of thousands of readers all over the Union. Several hundred similar societies have been organized in various sections, mainly modelled after this one, but, not having the same

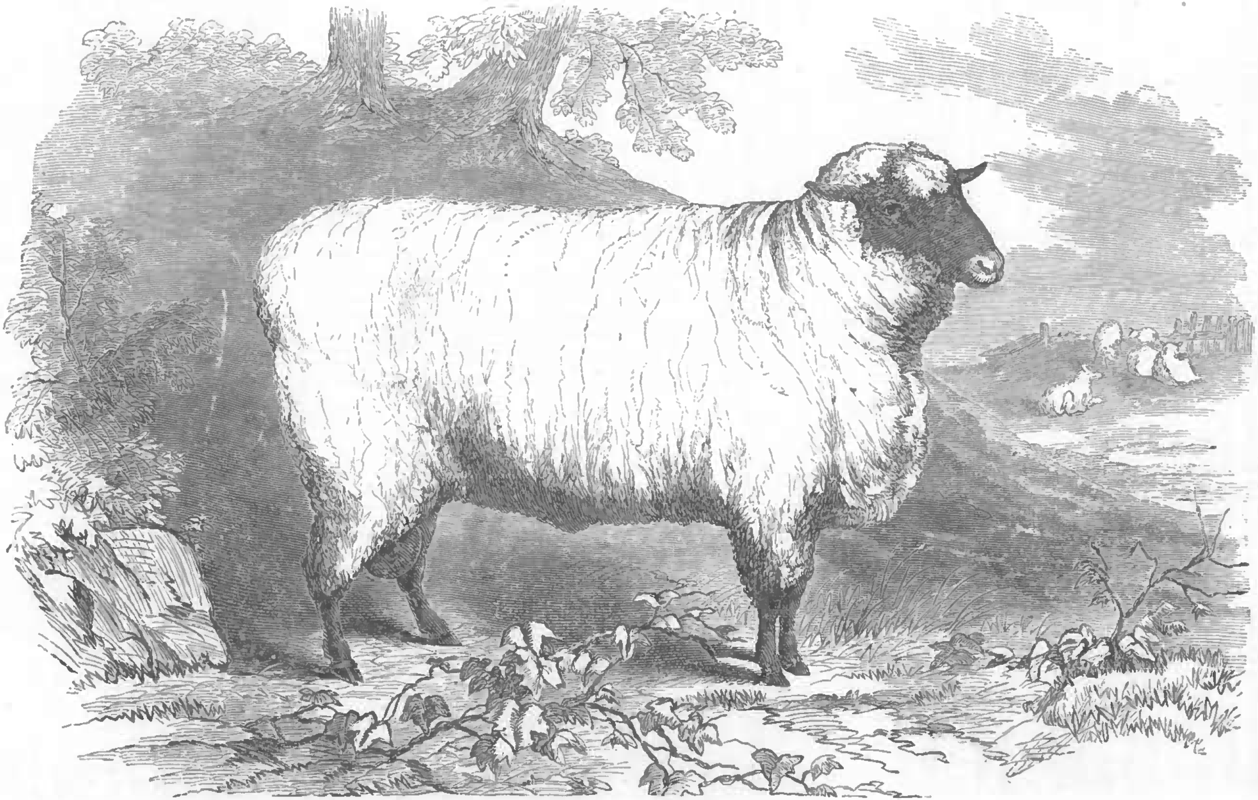


PLATE XXIII.

CHANCELLOR.

Hampshire Down Ram. Imported by ROBERT MORRELL, Manhasset, Long Island.

extensive resources, they have not proved as permanent or useful. That associations of the kind would be eminently beneficial in their several localities cannot be doubted; but how to conduct them so as to make them permanently successful in country places is the great question, which, if satisfactorily answered, would cause them to increase rapidly all over the land.

Few country clubs can hope to enlist any considerable amount of ability, such as gives interest and influence to the New York club; yet each section has subjects as important, and means to make them as interesting to its own inhabitants, would each farmer and gardener but feel and resolve to bring forward the first and use the others for their elucidation. A unanimous, continuous effort to this end, a prompt, punctual attendance at every meeting, a determination to interest and to please animating each mind and heart during the intervals between the meetings, would go far towards making any club, however small its district and limited its numbers, a permanent success. Perhaps I can better illustrate my views by giving a brief history of the Randolph (Vermont) Farmers' Lyceum, and some of its proceedings during the last term, from November to April, meeting every Monday evening. I offer this, not as a model, but simply as a specimen of what may be done and even greatly improved upon by any company of farmers and gardeners of common education, and actuated by a mutual desire for improvement, directed by common sense and kindly feelings.

The Randolph Farmers' Lyceum was organized six years ago with 13 members, by the persistent efforts of one man, a mechanic and amateur farmer, and has continued until it now numbers over 100 members. Its specified objects are, first, the acquisition and dissemination of agricultural knowledge; second, the promotion of acquaintance and friendship among neighbors; third, the improvement of its members in conversation, composition, and public reading and speaking; and fourth, the improvement of farms, farm implements, stock, buildings, and every department of agriculture.

Its principal exercises at each meeting for the first four years were an essay, followed by discussion. The fifth year an oration was added, and the last term an impromptu speech was required. The speaker is called to the stand, his subject given him by the president, and he required to speak five minutes on it without preparation. The essay and oration are limited to fifteen minutes each. No admission fee is required, and the annual expenses have amounted to less than ten cents for each member. Of course no subjects are admitted except purely agricultural ones, and, consequently, no unhappy dissensions have crept in.

Provision should be made by every lyceum for judicious and careful experiments, each to be confided to a certain number of members, who would subject every portion of the operations to the most careful test of weighing and measuring, and carefully enter on record every step in the progress of each experiment. At the conclusion of each experiment a full report should be made by each person engaged in making the same, embracing all particulars and details of soil, season, weather, operations and results. And such experiments, to be conclusive, should be renewed from year to year, until discrepancies cease, or can be satisfactorily accounted for.

During the last term of 22 weeks the following were among the subjects of the essays, orations, impromptu speeches, and discussions, with brief thoughts upon some of them, as selected from the minutes of the secretary:

Butter factories.—They were objected to on account of the small size of the dairies in this section; the great difference in the butter quality of different cows' milk; the cost of transportation of small quantities of milk from the farm to the factory; the loss of the skimmed and butter-milk, and the various chances for fraud in the establishment.

Ploughing in the fall.—This was recommended by some because there was more leisure, and the team is usually in better flesh and strength than in the spring; the sward land is in better condition for sowing oats in the spring; dry

land does not suffer so much from drought, and wet land is ready to work on earlier in the spring; in dry seasons seeding is surer to "catch;" clayey and wet, heavy soils are better exposed to the effects of the frost; to avoid "cut-worms," sward land, designed for corn, should be turned as late as possible in the spring, before planting, and the worms will live in the grass of the inverted sod rather than attack the young corn, and both fall and spring ploughing of the same land (except green sward) was recommended.

Impromptu speaking.—It was claimed that this faculty ought to be cultivated because nearly all the farmers have to speak necessarily without preparation, and they ought to be able to express their ideas as concisely and forcibly as possible; that it is a useful preparation for public duties, facilitates business transactions, increases influence, &c.

Farming then and now.—*Then* the soil was in its natural state, full of plant food; *now* that food has been withdrawn, and means must be taken for returning an equivalent. *Then* the wheat midge, fruit blight, potato rot, black knot, and hop louse were unknown, and there was no need of the constant effort and anxiety to find remedies *now* required. *Then* the dress and diet was simple, and almost entirely obtained from the farm products; *now* the products of the farm are unequal to the requirements, and foreign countries must supply the deficit.

The potato.—It was introduced into Europe in the sixteenth century by Sir Walter Raleigh, and has proved one of the greatest blessings bestowed upon man. Before the original elements were partially exhausted from the soil, 400 bushels of sound potatoes were an average yield per acre; now not half that amount. We must strive to return to the exhausted soil an equivalent for the original plant food.

What is the best mode of feeding stock coming from grass to winter quarters?—The change from grass to dry feed should be gradual; roots, cabbage leaves, and turnip tops should be plentifully interspersed with the dry feed; especial care should be used to keep all stock warm and dry; it is the most difficult part of the year for properly caring for stock, and they should come to winter quarters in good flesh, and what hay is fed to them should be of the best quality and early cut. Farmers are not apt to be prepared for winter when it comes, and their stables are often filled with pumpkins, farm tools, &c. Salt should always be accessible to all farm stock; the earliest cut hay should be fed first.

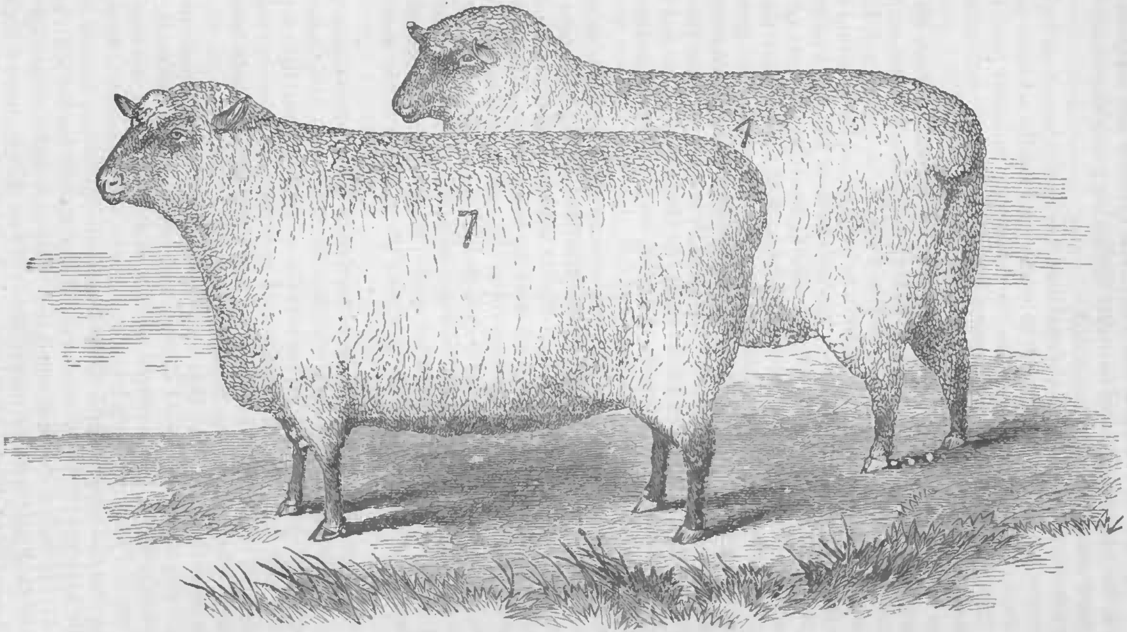
Who is the best farmer?—The chief motive of one in farming is to benefit his pocket; another constantly aims to improve his farm. One increases personal property, and squanders it or secretes it, so that the tax list of the town is diminished; the other converts labor and personal property into real estate, and increases the assessment list and the real value of the whole town. The one is a *robber*—the other a benefactor.

Farm implements.—Only the best should be used; the cheapest are always the dearest. Constant reading of agricultural books and periodicals, and frequent interchange of thought between neighbors are necessary, in order that all may know what is the best, because of the constant improvements being made.

Wintering sheep.—They should be kept in good order—not poor, nor too fat; they must be kept dry, but not too close. They should be fed with hay three times each day, in racks so constructed that they can feed comfortably without wasting their food and without quarrelling. They should have a little grain, and some cleaned and finely cut roots, once each day. About one bushel of roots, one peck of grain, and 100 pounds of hay daily, with some straw, will answer for 50 sheep, of the fine wool varieties. All sheep should be in a thrifty condition when they come to the barn for the winter, and should be allowed some exercise daily and what salt they desire. It was claimed that hoof-rot is incurable, unless checked in its early stages.

Machinery and farming.—Brute beasts were given to man for his convenience

PLATE XXIV



HAMPSHIRE DOWN EWES.

By Chancellor. Bred by ROBERT MORRELL, Manhasset, Long Island.

and subsistence, and he ought always to substitute their force for his physical power, when and so far as practicable. By the aid of modern machinery, more than one-half of the labor performed by man power 20 years ago can now be done by horses, so that a farm requiring 10 hired men at that time can now be managed with five at a greater profit.

Does "book-farming" pay?—Every one who reads, studies, judges, and practices discreetly, knows that the good he gets is more than the cost he is subjected to for agricultural books and papers—that it "pays." Those who think otherwise do not read the books and papers, and therefore know not what they condemn.

Influence of agriculture.—All men seek for happiness. Farming promotes health, and health pleasure. It tends to mental and moral development, and to present and future happiness.

Horse rakes.—There were several kinds alluded to: the wire, spring-tooth, riding rakes were recommended for all stony, or rough and uneven land, notwithstanding their liability to scratch up dirt, to the injury of the hay; but for smooth land, free from stones or other obstructions, the revolving, wooden tooth sulky rake was preferred.

Shall we sell our surplus feed or buy stock to consume it?—Sufficient stock should always be kept to consume all the stock feed, nothing being sold from the farm but stock and stock products, if the improvement of the farm is desired. It is more exhausting to the farm to sell off hay, grain, and roots than live stock, meat, dairy products, or wool. It is true the stock feed *might* be sold off, and its equivalent in fertilizers bought and applied to the soil; but observation proves that it is not often done. The avails of the farm, once in the pocket, generally are not returned to the soil.

Winter keeping of stock and feeding corn-cobs.—Much of the food which animals consume in winter is for fuel, or to keep them warm, and no animal can thrive if not warm. Warm stables save much food, and the few boards and nails required to make them warm cost much less than the extra amount of food required for the same purpose. Cobs, without *any* corn on them, are of less value as food than very poor straw, and are not worth grinding.

Breeding farm stock.—If the science is understood any stock can be bred to order. Grade stock cannot be duplicated with any certainty, but pure bred can, and none other should be raised.

What kinds of stock shall we keep?—There was no dissent from the opinion that the *best*, of whatever breeds or kinds, were the most profitable. Whether horses, cattle for market, dairy cows, sheep, or hogs should be the chief stock, depends much upon the location and condition of the farm, the number, age, strength, and taste of the family, and nearness and character of the market. New England farmers can better compete, in the Boston and New York markets, in dairy products than in wool growing; in pure bred and high-priced stock of any kind than in ordinary grades. A farmer, having a strong, healthy wife, and several faithful boys, can better "run a dairy" than one with a feeble wife and no children, for he would have to hire the milking, churning, &c., done. What is known here as the "Morrill breed" of horses is believed to combine the three most important characteristics, *size*, *bottom*, and *speed*, in the most equal proportions, and to a greater extent than any other breed, although they can hardly yet be called "thorough bred." The "Vermont Merino" is the best breed of sheep; "Chester County Whites," the best hogs. For the "mixed husbandry" of New England, (the small farms having both high land and meadow,) the Devons are best for oxen and beef; for butter, milk, or cheese dairies the "Ayrshires" are undoubtedly the best. The "Durhams" are the best of those sections where beef is *the* object, and where the land is level and the soil rich, and naturally producing the "Kentucky blue grass."

Barn buildings.—There is no economy in patching up or piecing out old dilap-

idated barns. It is much better to "pull down and build greater." It is generally the best economy to have all the farm store-room and stables under the same roof—the barn having a basement for manure, &c.—rather than to build sheds for the purpose. The stables for stock of all kinds should be proportioned to the size and number of the animals to be kept therein, and as small as consistent with the greatest convenience, so that, being tight boarded, the animal heat will keep the temperature above freezing in the coldest night. That part in front of the stock should be hung upon hinges, so as to be let down for feeding or additional ventilation, and the several windows should be so constructed as to afford light and ventilation to any desired extent, both being important, as well as proper temperature and suitable food.

Fences.—There is an average of six rods per acre, or, in all, 171,576 rods of fence in Randolph, costing at least 75 cents per rod; probably one half is for convenience in "fall feeding" mowing lands, which is poor economy. The first growth of cherry or butternut is the best wood in this region for posts, and August and September the best time to cut them.

What kinds of stock improve farms most?—On this question there was nearly an equal division of opinion expressed. Some contended that dairy cows, running in the pasture through the day, during summer, and stabled at night, with plenty of absorbents for their liquid excrement, and a sufficient number of calves or hogs kept well bedded, to consume refuse milk, would furnish more value of manure than any other stock. Others claimed that horses and sheep would furnish more manure during summer and winter. All agreed that sheep, by scattering their excrements more evenly, and habitually lying at nights on the highest and poorest parts, benefited pastures more than other stock. Cows, pastured only during the day, remove the strength of the pasture to the tillage land.

The comfort of farm stock.—Any and everything that detracts from or prevents the comfort of stock hinders their thrift, whether it be hunger, thirst, cold, heat, light, darkness, wet, impure air, hard bedding, filth, vermin, stinging insects, frightful noises, loss of young or of old companions, wind or disease; and whatever hinders their thrift is a pecuniary loss to their owners. Human sympathy added to animal comfort amounts to dollars and cents!

Latent powers of man and the soil.—A kind Providence has given man moral, mental, and physical powers, according to the circumstances of his existence, and placed him upon the earth, containing productive resources sufficient to maintain that existence. Within both are dormant energies requiring development and invigoration, for which man alone is responsible. In doing this work rightly he finds a pleasant home and a happy life; in neglecting it, he only eats bread in the sweat of his brow.

The hay crop.—As the value of this crop is about one-seventh greater than the grain crop in Vermont, and as we have to feed our stock from six to seven months each year, it is very important that the best methods of producing and securing it be understood. The land should be in good condition where seeded down. It is useless trying to raise a good crop of grass on land exhausted by previous crops. Land too wet for tillage should be often top-dressed, if not annually overflowed. The best barns and blooded stock are without profit, if the right kind and quantity of hay is not put into them at the right time. There is much loss by letting grass get too mature before cutting. Timothy should be cut when first heading out; clover, when in its first blossoms. Grass is now cut in this vicinity from one to three weeks earlier than six years ago; and it is found that, although it costs a little more to cure it, there is much gain in the value of the hay, and the soil is exhausted less. The soil should be in such condition as to bear two crops annually, each yielding two tons of hay per acre. Land too moist for tillage, and needing manure, may often be smoothly turned over after the hay is taken off, well manured and re-seeded, to much better advantage than by simply top-dressing. On all small farms, where the hay is raked and drawn

by one horse, and the land is suitable, the grass should be mowed with a one-horse mower, and the Pony Clipper was recommended as the best for the purpose. The Ames Plow Company's hay tedder, from observation of its working at public exhibitions, was recommended, but has not been practically proved here. Several kinds of horse-forks have been used, and are recommended for large farms.

Raising calves.—They should be taken from their dams immediately, not being allowed to suck at all, or more than once, and fed with new milk ten to fourteen days, twice each day. For the next week they should have warmed milk, skimmed at 12 hours old. Gradually thereafter they should be fed with older and blue milk, till, at four weeks old, they will take any kind of refuse milk cold, with crusts of bread or porridge in small quantities. From the time they are a week old a little of the best early cut hay should be given them three times a day. At three months old they may be weaned and turned to pasture, though it is well to continue the broken bread, porridge, or a little dry meal or oats.

Making farmers' homes attractive.—There is a strong contrast between slack and slovenly farmers and those who are thrifty and tidy; and no farmer is excusable for the utter disregard of taste and neatness so often manifested. It is bad in all its consequences, especially in the deprivation of the good and elevating society thereby lost; the dissatisfaction the children soon feel with home, as they approach years of maturity, and the consequent loss of self-respect by all the members of the family. Farmers' homes should be made as attractive and pleasant as may be, and much can be done to this end with very little expenditure of money.

The best method of keeping cows.—Under all circumstances they should be treated with kindness, gentleness and firmness. In winter early cut hay or corn stalks, as much as they will eat clean, should be given them three times each day; also, four to eight quarts of cleaned and well cut vegetables, and two to four quarts of oat-meal. They should be kept in clean, warm, well ventilated and lighted stables, always have a dry and soft bed, and be fed, watered, carded, and milked at regular intervals. They should "go dry" from two to six weeks, and be fed lighter a few days before and after calving, to guard against inflammatory attacks.

Farmers should be mechanics.—On every farm there should be a shop-room, with work-benches and a kit of tools, comprising all such as may be required for any ordinary repairs of buildings or wooden farm implements, and every farmer should have skill to use them. Having them, many repairs and necessary jobs can be done, in less time than would be required to carry the job to a regular mechanic, and often in a better manner; while no more time will be lost, and some money will be saved. With a soldering-copper, rosin, and solder, with a few minutes' practice, much inconvenience and expense can be saved by repairing tin-ware, water-pipes, &c., in odd moments and on rainy days.

Soiling cows.—Stabling cows in summer and feeding with green food has not been practiced to any considerable extent in this vicinity; and so long as good pasture land can be bought at $50 an acre, within one mile of our houses, it is uncertain that soiling would be profitable. With tillage land at $100 per acre, and boys (sons) old enough to drive cows to pasture, but not able to cut green feed for them, it is thought the better policy to pasture cows; but for those who pasture $100 land, near their barns, soiling will pay, even if all the labor is hired.

Pumps.—Next to a good running stream is a good well, with good, never-failing water in it, and a force pump, with which water can be thrown to any part of the farm buildings—one that is always in good working order, and can be worked by a child. Of the many kinds invented, not one has proved to be the pump thus described for farmers' use.

Objects and construction of barns.—The objects of barns are for storing farm

products, sheltering farm stock, and saving manure. If hay and grain were always well cured before being housed, they would be preserved the more perfectly, the tighter the barns were made; but as they are very liable to be housed before they are sufficiently cured, and when they have sufficient moisture in them to cause heating or fermentation, it is better that the barn should be loose boarded, that there may be a freer circulation and a stronger current of air. It has been often noticed that in such a barn hay may come out perfectly sweet and bright from the outsides of the mow, when the central part may be much damaged by fermentation; and if the same hay had been put into a tight-boarded barn it is probable that all would have been equally damaged.

Stables should be made tight and warm, and be ventilated by openings to the external air, and not into the storage part of the barn, to prevent noxious vapors from the stables being absorbed by the hay, &c. The basement, where manure is stored, should have a tight floor over it for the same reason. Where it is practicable, it is best to have the drive-way for drawing in hay, grain and corn fodder enter the gable end, for convenience in unloading, and saving time and help in the most hurrying season, as one man only is necessary to go to the barn with the loads. It was claimed that a man had better hire money at six per cent. and pay five hundred dollars for this convenience of unloading than not to have it.

Stock raising.—This branch of farming has not received sufficient attention in this vicinity. The kinds and breeds of stock, and manner of keeping, decide the question of profit or loss. We should breed only from the *best* parents, as to constitution, soundness, symmetry, and all the qualities desired in their offspring Any breed can be modelled and improved by proper crossing and keeping Although there have been over one hundred importations of blooded cattle into this town within the last forty years, there has not been that manifest improvement there would have been, had a greater proportion of females been brought with the males of the same blood. Thorough-bred stock can be duplicated with certainty, but grades can not.

The corn crop.—The land should be green sward, turned late in the spring after the grass is well up, and just before the time for planting. After the furrows have been rolled down, a good coating of fine stable manure should be well harrowed in with a cultivator harrow. After furrows have been made, three and a half feet apart, a shovel-full of decomposed manure should be put in them, at intervals of three feet, and corn planted thereon, being covered with fine soil about two inches deep. The ground should be stirred with a cultivator or hoe once a week until the corn begins to tassel. On low, wet or heavy land, the manure should be spread upon the grass, and with a double mould-board plough two furrows should be turned together, leaving the manure between them. After being rolled and harrowed in the direction of the rows, the corn is planted on the rows without manure in the hill.

Water.—Analysis teaches us that the largest proportion of all the food of animals is water—turnips containing 93 per cent. of water, and most other kinds of food over 50 per cent. Besides what is contained in the food, all animals want a large amount of pure water daily to quench thirst, and it should always be easily accessible. No stock, especially milch cows, should ever be compelled to drink stagnant water, or such as has been rendered impure by their standing in it, or from any other cause, as it tends directly to disease.

How can farmers' boys be made to love farming?—By cultivating fruit to such an extent that they shall love the farm that produces it. Their home must be made pleasant, tasty, and symmetrical in its external appearance, beautiful in its surroundings and in its internal construction, and orderly in its management. Peace, harmony and quietness must exist between the parents and throughout the household. A firm, decided and mild government must control all the children, boys and girls, alike. The children must all be early led

VICEROY AND EMPEROR 2d.

Cotswold Rams. Bred by ROBERT GARNE, Aldsworth, Northleach England, and imported and owned by BURDETT LOOMIS, Windsor Locks, Conn.

PLATE XXV.

to feel a degree of interest and responsibility in the success, prosperity and respectability of the family as a whole, and of each individual member of it. Give the children as thorough an elementary education as practicable, and always furnish them with a good variety of agricultural books and periodicals. Keep from them all sentimental romances and criminal biographies. Show them that you are yourself interested in farming, and do not go to your work grudgingly. Encourage them to experiment in farming.

Ventilation.—It is nature's physician, and just as necessary for brutes as for human beings. Respiration in pure air is an efficacious way to relieve the system of impurities contained in the blood. If stables could be made warm only at the expense of proper ventilation, they had better be cold. Warm air is not necessarily impure, and as animal heat comes more from the body than the breath, stables may be both warm and well ventilated.

Fruit.—As those of this generation are eating fruit from the trees our fathers planted, so we ought to keep on planting trees for the next generation. Even if but one tree in ten lives and bears well, that one is worth more than the cost of the whole; but with proper care and discretion in selecting and setting the trees, and in preparing and cultivating the soil, nine out of ten may live and be productive. Most pruning should be done when the sprouts are so young and tender that they can be cut off with the finger nails. It is beneficial to mature orchards to allow hogs to run in them and eat the wind-falls and wormy apples. The gooseberry is the cheapest and most prolific berry raised here, but the cultivation of blackberries, raspberries, and strawberries is profitable and strongly recommended.

Political education of farmers.—Although farmers as a class comprise a larger number than any other, yet whenever they have any public matter of especial interest to themselves, they are almost always obliged to go to one of another class or profession, in order to get their matter before the legislature or Congress. Men from another class or calling, who, of course, cannot fully know or appreciate the necessity of different legislation in regard to this or that farming interest, are the only resort, and poor help they often prove. Instead of this, farmers should be so educated and trained as to be qualified to do such work for themselves. Their occupation should take its proper position as a profession, and exert its proportionate influence, civilly and politically, as it heretofore has physically.

Insect injuries to fruit trees, and their remedies.—Insects rarely attack the most healthy and vigorous trees; hence the importance of effort to keep fruit trees in the most thriving state. The black louse, imbedded in the bark, lays her eggs, and covers them till hatched, then removes to another place and repeats the process. The grain lice are attended by ants which seem to milk them, living upon a sweet substance exuding from them. They are often killed by another insect which breeds within them, and is their constant enemy and our friend and helper. Many other kinds were mentioned, and constant study of their nature and habits urged, as necessary to their extermination.

Sources and application of manures.—It is hardly possible to over estimate the importance of this subject. The amount and quality of our crops are just in proportion to the size and quality of our manure heaps, which are the food our crops live on. Great loss has heretofore accrued by not having proper facilities, or using proper care to save the liquid manure, which, if properly applied, is of equal value with the solid excrement from all our stock. The solid has but about one per cent. of mineral matter, while the liquid has four per cent. Reservoirs for saving the urine were strongly recommended on account of the difficulty of saving it all by the simple use of absorbents. Covering manure with the harrow or cultivator, from two to four inches deep, is generally practiced now, rather than plowing it under to a greater depth.

For all crops for which an early start and rapid growth in the first part of the

season is desired, thoroughly decomposed barn manure is the best; otherwise raw manure may be used, and some loss avoided that usually occurs during decomposition where it is not mixed with the soil. Although some commercial manures may be used to advantage under some circumstances, especially for turnips and other root-crops, they cannot be relied upon for ordinary purposes instead of common barn manure.

Farmers should secure all the wood ashes they can to apply as a top dressing to meadows or grain fields, but they should not be mixed with any raw or unfermented animal excrements. More effort should be made to save all refuse matter about the farm or buildings, which may be converted into manure by composting or otherwise. A proper application of cold water to manure heaps will prevent their "burning" but not their decomposition.

Lice.—The common impression that leanness in flesh is the cause of lice upon farm stock is erroneous. Several instances were given where the most hardy, healthy and fleshy animal on the premises was first afflicted with lice. Lice are the cause rather than the effect of a poor condition, and they are not transmitted in or by the blood or secretions of the system, as is said to be the case with the animalculæ of the itch. They may be destroyed with a little care and attention, by the application of melted tallow and kerosene oil, mixed till soft enough to rub in easily at temperate heat. It should be applied once in three days to all parts of the animal where the lice can be found, and be continued so long as any remain. Ordinarily two applications are sufficient, as the lice are killed as soon as they touch it.

What is plant food?—All that plants consume in their growth is plant food; but then there are other things which cause them to grow. There may be sufficient nutriment within reach of the rootlets, but it may be in such a state or condition that it cannot be appropriated, just as a bushel of corn might stand within reach of a starving man having no teeth and he be not benefited by it. A proper proportion of acids, alkalies, &c., must be in the soil to modify and render palatable the mineral and vegetable matter Providence put there for the nourishment of plants. To this end the soil must, in a sense, *breathe.* It must be kept light and porous, that the atmosphere may thoroughly permeate it, and produce the chemical changes necessary for the best subsistence of the plants, and to facilitate the absorption of the falling rains for a similar purpose.

Account with a half acre of corn.

Dr.—To planting half day	$0 75
" two days' hoeing	3 00
" 12 small one-horse loads manure	5 00
" harvesting and husking	5 50
	14 25
Cr.—By 75 bushels of ears	$52 50
" 1,500 pounds of stalks	8 00
" 3 loads pumpkins	3 00
	63 50

Account with two acres of wheat.

Dr.—To plowing and harrowing, and sowing	$8 50
" half the value of 28 loads manure	14 00
" 4 bushels seed, $12; interest, $6	18 00
" threshing and harvesting	11 00
	51 50

Cr.—By 35 bushels wheat	$96 25
" straw	12 00
	108 25

Product of 3¼ acres of corn, potatoes, &c.

275 bushels of ears	$205 50
4 tons of stalks	60 00
30 bushels of potatoes	22 50
12 loads of pumpkins	6 00
	294 00

It cost 20½ days' labor, but account of the other expenses was not kept.

Best management of cows before and after calving.—The whole subject may be briefly comprehended in the single word *comfort.* Whatever management or circumstances tend to afford the greatest net amount of comfort is best for them. They should have that amount and quality of food which they relish sufficiently to lead them to eat their reasonable fill of it; and it should possess such nutritive qualities that just that amount will keep them in a thriving condition. Their food should not be so concentrated as to fail to give them the proper stimulus of distention, nor the reverse; so that in taking sufficient nourishment they must take an uncomfortable bulk of it. Ordinarily there is no better food for them than good, early cut hay; *i. e.*, well cured grass. The custom of beginning to mess cows a week before calving tends to an increased amount of blood in the system, which at that time is not desirable, as it favors inflammatory attacks. It is safer to diminish this tendency for a few days, before and after parturition, by rather lighter feeding. It is an erroneous idea that calves should run with their dams a few weeks in order to "bunt down the caked bag." No violence should ever be suffered, and gentle rubbing and bathing with warm water is the most agreeable to the cow, and useful to remove inflammation. If the placenta is not discharged within six hours bathe the small of her back and groins with warm water until it is dropped, or so long as there is unusual heat at those parts, avoiding violence and all powerful medicines for that purpose.

Household conveniences.—Farmers are too apt to forget the inconveniences their wives are subjected to in the discharge of their duties indoors. They remodel and repair their barns, stables and farm implements as often as their own convenience and profit indicate, and buy new implements in the same way. They see the importance of it as they engage in their daily avocations. Are they as anxious that their wives should be equally accommodated in their sphere? Are not the labors of the latter often increased 100 per cent. for the want of a better cook stove, more tin pans, a better pump, easier access to the cellar, a more suitable milk room, more paint on the kitchen floor, new paper on the walls, scrapers and mats at the doors, a new broom, an occasional ride in the open air, suitable domestic help, &c.? Farmers and their wives being one flesh ought always to remember and feel that their interests are one and the same—that they are equally responsible for the prosperity, success and respectability of the family, according to their relative circumstances and capacity.

Ayrshire cattle.—This popular breed has existed as a distinct family in Scotland for nearly 100 years, having been bred chiefly for dairy purposes. They are a hardy race, symmetrical in form; speckled or striped with white, red, brown, and black colors; of good medium size; energetic, kind and docile in disposition, easily fattened, long lived, and especially remarkable for milking qualities. It is claimed that there is no breed that will yield so much milk,

butter or beef, from the same amount and expense of food, as the Ayrshire—especially in hilly or swampy sections of the country.

Lesson to farmers' boys present.—It is well that you have an interest to attend these meetings. You should be impressed with the importance of a good education, and an agricultural education, now while you are young. "Knowledge is power," as surely now as ever. Useful knowledge is power for good; knowledge of evil may be power to your hurt. Strive to treasure up the knowledge acquired at these meetings. It will do you good in whatever business you conclude to follow. Let honesty be your guiding star. Be prompt to fulfil all engagements: but if circumstances prevent, make satisfactory explanation. Be thorough in all your business. Be sure that every article that you raise, make, or trade in, is as good as (or rather better than) represented. Eventually "honesty is the best policy," if policy is proper in regard to it.

Maple sugar operations.—There is no branch of farming carried on with so little outlay for fixtures. Farms in Vermont will not average $40 in investment for all their sugar-making conveniences. Comparatively little improvement has been made in the maple-sugar business for two generations. The old troughs for catching sap have been displaced by tin or wooden buckets, and the hemispherical cast-iron kettles by sheet-iron pans, for boiling, and the stone arch or straddle-pole by a brick arch. Notwithstanding this there is still great room for improvement, and the same evaporation, now requiring 14 hours, and the fourth of a cord of wood, may soon be done in six hours, with half that amount of fuel. Greatly improved evaporators will soon appear.

Muck.—What we in this vicinity understand by this word is a dark-colored fibrous vegetable turf or deposit, found in low places, which have for a long period received the leaves, broken twigs, and decaying vegetable refuse from the surrounding hills. It is usually saturated with water a large part of the year, and to render it useful as a fertilizer it should be thrown into heaps, and after remaining thus through at least one summer season to dry, it is drawn to the barn and housed, to be used as needed through the year for bedding, and as an absorbent of the liquid excrements of all farm stock. After it is thus saturated it is thrown into heaps with the solid excrements to ferment, and by working over soon becomes an excellent compost for corn or other uses. When mixed with lime and ashes and allowed to ferment, it produces marked results, or mixed with plaster and salt it seems to be a useful fertilizer. When applied to crops in a pure state it produces little, if any, effect.

Horses.—For ordinary use on the farm and on the road we want horses of all work, weighing from 900 to 1,200 pounds, for driving in light buggies; 950 to 1,000 pounds is large enough, but few of us (one-horse farmers) can afford to keep a separate horse for each kind of service required, so that a heavier one is more useful.

We should turn our attention more to raising horses. The "Morgan" stock originated here, and for scores of years our town was noted for its superior horses, but other towns in the State now wear the honors we ought to enjoy. Many farmers are so situated that they could raise a good colt each year that would cost them but little, if any, more than a calf of the same age, yet worth four times as much.

For my horse of all work I keep an English breeding mare, which I use at least 11 months out of 12 each year, and yet during the last four years she has brought me four colts, averaging in value at five months old $100 each, the last one bringing me over $125 before he was three months old; and, with care in the selection, I coupled her with low-priced horses at not over $8. During the time she has "well paid her way" by work, so that the colts are net profit. Almost any farmer with care, discretion, and judgment can do as well. The price of good horses is higher than ever, and annually increasing.

The foregoing is a fair illustration of what the Randolph Farmers' Lyceum

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JUDGE LAWRENCE

Merino Ram. Owned by CURTI KELSY Sidney, Ohio.

has been doing each of the last six years, while annually it has increased in interest and influence. No intelligent resident of this vicinity can question that its effects have been very perceptible and beneficial, and have not been confined to those only who have attended the meetings. The good influences have operated through the whole neighborhood, and to some extent through the New England States, by means of the occasional reports of our meetings in the weekly newspapers.

These effects are perceptible in the increased spirit of inquiry and investigation existing; in the greater number of agricultural books and periodicals paid for and read; in the better employment of spare time in reading and writing, rather than in indolence and vice; in the increased willingness of farmers' boys to stay at home, instead of hurrying off to the city for other employment; in the greater readiness to make experiments in all departments of agriculture, believing that all knowledge, except divine knowledge, is the result of experiment; in the improved appearance of farms and farm buildings; in the better adaptation and construction of buildings to the ends desired; in the improvement of farm stock; in the increased amount of barn manure made and stock kept; in the increased fertility of the soil; in the better quality and greater number of labor-saving implements; in the improved household conveniences; in the good will and kind feeling promoted among the members, and through the community; and in the development of the dormant energies, powers of thinking, reading, writing, and speaking, not before supposed to exist. These, or other like good effects, have been secured at the small annual expense of less than *ten cents* for each member.

I know of no reason why such effects would not result from a similar institution in almost any other locality. One or two efficient men, understanding and appreciating the case, who would put their best energies into it, and always be present themselves until the organization shall have acquired that internal strength which is sure to result from a practical knowledge of its benefits, is all that is needed to secure success.

DIVERSITY IN AGRICULTURAL PRODUCTIONS.

By Thomas S. Pleasants, Petersburg, Virginia.

That the prevailing system of agriculture in every civilized country rests on a basis more or less rational, will not be controverted. There is reason why some sections should be specially devoted to the production of the grasses, including the cereals—in other words, to farming; and others to what is termed planting. A controlling influence is also exercised by the species of labor employed in the cultivation of the soil. The order and exactitude requisite in conducting the operations of planting are thought to be best promoted by having a sufficient amount of labor at the absolute control of the planter. This is especially true in regard to the management of cotton, sugar, and rice; and partially, if not equally so, of tobacco. On the other hand the successful production of grain and grass admits of a change of operations from year to year; and, indeed, of a reduction or increase of the number, temporarily, during the progress of the season. A few steady laborers, with such accession of force at busy times as the occasion demands, are sufficient, under intelligent superintendence, for the general work of the farm. But the conditions necessary to successful planting are of a more stringent nature. The loss of a few days at a critical

season might involve the failure of the crop, or at least make all the difference in the result between profit and loss. Hence the planter must provide himself at the beginning of the year with the amount of labor requisite to meet all contingencies. With this under his control he is able to carry on his operations with all the precision of machinery.

It was under such conditions as these that the planting interests of the south grew up and flourished, and attained an almost unexampled prosperity until a very recent date. Those who have not had the opportunity of witnessing the manner in which these industries were prosecuted, can form but a faint idea of the skill, judgment and capital necessary to success. It is owing to the absence of these conditions during the last three years, more than to any other cause, that almost every attempt to continue the culture, on a large scale, of the leading staples of the south has resulted in disastrous failure. The climate and soil are the same; the planter has lost none of his skill; the former labor of the country still remains, and the difference in expense between free and involuntary labor is not so important an element as to affect the general result, but it is the difficulty, or rather the impossibility, of regulating this labor in the most efficient manner which now constitutes the greatest impediment to profitable planting.

In following this course of remark it is no part of the intention of the writer to express any opinion on recent public events. They have passed into the domain of history, and it may require 25 or 50 years to pass, before an intelligent judgment can be rendered upon them. It was deemed necessary, however, to state present facts and difficulties exactly as they exist for the purpose of drawing the deductions to which they inevitably lead, namely, the absolute necessity of abandoning, in great part, the old system of planting, and of substituting in its place such a diversity of crops as will enable the cultivator to derive from several smaller sources an equal or greater amount of revenue than was formerly derived from the cultivation of a single leading staple, to which everything was made subservient. For though it may take years to convince the southern planter that what was formerly the source of so much profit must still continue, under favorable circumstances of season and prices, to afford him a handsome income, he will be convinced at last, and the sooner the better, that the planting business can never flourish again in the south under the altered conditions of the country, even if it were desirable that it should, which, indeed, may be well questioned. Not that the culture of cotton (for instance) or tobacco will be entirely discontinued, but the large plantation system has come to an end. Hereafter those staples will be grown, it may be, by many cultivators in limited amount to each one, though, perhaps, considerable in the aggregate, and only as one among a variety of productions entering into general culture. Cotton is now raised in many countries, and of a quality approximating every year more nearly to that of the best southern staple, and cheaper also than it can possibly be grown here. In the natural course of supply and demand the price will eventually, and probably at no distant day, settle down at a very moderate profit on the cost of production; while, therefore, many landholders may raise a few bales, one, two, or three, where it can be done in an economical manner, and within the limits of moderate resources, the old plantations of a thousand bales, or five hundred, or even a hundred, are to be regarded as altogether of the past, never to be revived; nor is this to be regretted. The effect was oligarchical, making the rich richer, and the poor poorer, while the tendency of the age is essentially democratic. For though the south has contributed enormously to the general prosperity and wealth of the country at large, the exports of her principal staples amounting to several hundred millions a year, it cannot be denied that there was too much inequality in her social system to be friendly to any general agricultural improvement. Steady progress in agriculture can only be developed when the great majority of the owners of land occupy something like the same social

plane. It is under such influences alone that general intelligence becomes diffused among the people, and a spirit of laudable emulation in industrial pursuits is excited. In the planting districts, indeed, owing to the cheapness of land, almost every man may become the possessor of some portion of it; but, unless he has the means to cultivate it to advantage, he dwindles away in the shadow of his more prosperous neighbors; his family, perhaps, sinking into poverty and ignorance, and forming, with others of the same class, a degraded caste, from which not one in twenty is ever able to emerge. Whoever has carefully looked into the state of southern society can scarcely have failed to note these facts; for, while the upper classes have been distinguished for cultivation and refinement, and have furnished more than their ratio of men who have occupied high places of honor and trust in the government, the result has been the intellectual dwarfing of one-half the population.

At first blush it may seem that, in so far as the prosperity of agriculture is concerned, the experience of Great Britain, where social irregularity prevails to a greater extent than here, does not support the positions herein assumed. It is believed, however, that there is nothing really conflicting in the two cases when brought fairly into comparison. With a dense population and a very limited area of land, which is all in the hands of the few, the English proprietors are rigorous in the terms exacted of their tenants, which necessity compels the latter to accede to; if one should fail of compliance, others are ready and willing to take his place. Besides this, the proprietors themselves, out of their enormous revenues, are lavish in expenditures for improving and beautifying their estates. So that there is strictly no analogy in this regard between the two cases, while in everything else, by the unequal distribution of property, the depressing effect on the masses is the same. It is the possession of property, of being well-to-do in the world, that makes all the difference between refinement and intelligence on the one hand and debasement on the other—in a word, between civilization and barbarism.

The system of culture in the south develops the evils of exclusive planting in a striking manner. From the first settlement of the country it has been exhaustive instead of ameliorating. With an illimitable extent of territory, it was found to be more convenient and less expensive to open the virgin forest and bring it into cultivation than to improve the soil after it had begun to fail. If the south had not been by nature one of the most favored countries in the world, this course of rapid depletion would at no distant day—perhaps in another hundred years—have resulted in the general impoverishment of the land.

Let us now contrast with this system that other system of agriculture which is founded on a diversity of crops; and in drawing the picture there is no necessity to travel far from home. Between the greater part of Virginia lying between James river and North Carolina on the one hand, and those portions of the State designated as "the valley" and the "Piedmont district"—the one situated between the Blue Ridge and the Allegheny mountains, and the other extending along the eastern slope of the Blue Ridge—on the other, we find all the elements requisite to carry out our purpose.

In southern Virginia the soil is light, kind, and pliable, perhaps not so rich naturally as that of the valley, (being of a later geological formation,) but easily rendered capable of producing almost any crop that may be committed to its bosom. The counties nearest the Blue Ridge have been remarkable for their fertility, and it is in them that most of the fine Virginia tobacco has been grown from almost time immemorial, while in the eastern section of this division cotton and corn have been the prevailing crops. This section of the State possesses, also, the great natural advantages of being intersected by many navigable streams, furnishing the cheapest transportation for produce from within a few miles of almost every man's door to all the great markets of the north. It might be supposed that a country thus blessed would be in the enjoyment of the high-

est degree of prosperity; but there are comparatively few evidences of systematic improvement. On the contrary, a much larger area of land has been abandoned to the slow recuperative processes of nature than has been brought under a course of amelioration. We see large plantations too unwieldy to improve further than lots devoted to special crops. No fields of grass, no attention paid to stock or the accumulation of manures, but vast sums expended in the purchase of fertilizers, whose activity is exhausted in a single season. Instead of laying down meadows, the planters prefer to buy hay imported from the north. The quantity of the article sold in our market, and sent oftentimes hundreds of miles into the country, is something marvellous. The planter also buys his flour, his meat, the whole stock of clothing for his family, his wagons and farming implements, even the butter on his table, and frequently the corn for his stock and his bread. Now, when the long list of articles is paid for, with others still that might be enumerated, the amount of net profit remaining is seldom considerable, and sometimes nothing at all. Casting our eyes now over the rural, or purely farming districts, what a change do we behold! We see the surface cut up into tracts of manageable dimensions, with large barns and commodious dwellings. We see the land under a regular rotation of crops; fields of luxuriant grain and grass; meadows yielding an abundant supply of hay; fat cattle and productive dairies. We see flocks of sheep, fine orchards, and evidences of thrift on every side. The owners, perhaps, derive no large income from the sale of any single item; but, gathering something from numerous sources, the aggregate amounts to a handsome sum, while, living more within their own resources, the expense of cultivation and family maintenance absorb a less proportion of the gross profits. Moreover, should any one crop fail, disaster cannot be expected to befall all; but, under the most unfavorable circumstances, some one or more will succeed; and last, but not least, under ordinarily good management, the farm will increase in productiveness and value from year to year, while the opposite is the case in regard to the plantation.

It may be urged in answer to this, that the valley and Piedmont lands are naturally better adapted to grass and grain than those of tide-water Virginia. This may be conceded. But if the same generous treatment had been applied through a series of years to our lowlands that has been bestowed on the farming districts, it may be confidently affirmed that the profits of agriculture therein would have been fully equal to any in the most favored localities; and the truth of this assertion is susceptible of proof in numerous instances. It will be admitted by all intelligent agriculturists that lime forms the basis of every system of durable improvement. Here we have it in abundance, in the form of rich and inexhaustible deposits of shell-marl underlying nearly the whole country. In addition to this, the facilities of navigation are such that nearly every farmer can have what is known as agricultural lime delivered almost at his door, at a moderate cost. Farmers in certain localities have largely availed themselves of this advantage, as, for example, along the margin of James river, where the soils once nearly exhausted by improvident culture have been so much renovated in the course of a few years—say after two or three rotations—as to yield 25 or 30 or even 35 bushels of wheat to the acre, and this not on a few acres only, but on fields of hundreds of acres; the land also being put in condition to produce heavy crops of clover and grass, and all this without the aid of guano. It may be doubted whether the results attained can be surpassed in the far-famed Cumberland and Genesee valleys, or even in the fertile prairies of the west. What the soils of tide-water Virginia chiefly need is lime, either shell or stone, and with this at command, with a generous course of improvement—such a course, for instance, as necessity compels wherever farming proper exclusively obtains—it is capable of being made one of the most desirable countries in the world. The capacity of these soils for producing most if not all of the fruits of the temperate zone has been satisfactorily established,

and now, under the change which has taken place in the whole labor system of the south, our only resource is a rational reform in the old methods of cultivation. So far as the interests of eastern Virginia are involved, if the abolition of slavery should result in bringing about a revolution in our system of agriculture, it will prove an incalculable blessing, instead of a calamity, however stunning the blow may have been at the time of emancipation.

The climate of this region is mild and genial. It is equally exempt from the long and rigorous winters of the north, and from the protracted and relaxing heats of the summers far south. It is not intended to assert that the inhabitants are not liable to disease. Doubtless they have their share, which consists mostly of autumnal fevers; but, taken together, it is believed the climate is quite as salubrious as that of other States on the Atlantic coast farther north. Consumption is but little known, and diseases of an inflammatory or typhoid character do not prevail to any considerable extent. The average duration of human life is believed to be quite as great here as in more elevated regions. But when the country becomes more thickly settled, the benefits of more thorough cultivation and drainage cannot fail to add to the healthfulness of the climate, and to render it as delightful as that of Italy. It has been ascertained from actual experience that the free use of lime or marl is of great benefit in correcting malarious influences.

Regarding, then, the geographical position of lower Virginia, with its extraordinary advantages of soil and climate, and its unrivalled river system, it would seem that nature had pointed out the uses it was intended to subserve, in characters so legible that he who runs may read. Whatever can be grown elsewhere, as before observed, can be grown here, while the various products of the country, by reason of the difference of seasons, can be delivered in the northern markets several weeks in advance of those of a higher latitude. The superior quality of Virginia wheat, the flour from which retains its sweetness in all climates, is well known, and the early deliveries command from ten to twenty cents more per bushel than that from the northwest at a later period of the year. Beyond fruits and vegetables, but little has yet been done towards supplying the northern markets with the early products of the south. This business, indeed, admits of almost indefinite expansion, for though continually increasing, the demand is always ahead of the supply. It has been prosecuted in the vicinity of Norfolk with extraordinary success for a number of years, and to some extent along the margin of the large water-courses, where the facilities, both for production and transportation, are equal to those of any other locality. The contiguity of extensive sheets of water is a certain protection against the damaging effects of late frosts. Peaches and apples are considered among the most profitable crops that can be grown, as they are always in demand at high prices on the spot, wherever a skipper can navigate his craft. The early apples, from a thrifty and well established orchard, have been sold as high as a thousand dollars per acre. As there is no limit to the demand, the farmer can scarcely err in devoting a part of his premises to the culture of this fruit, always being particular to select the very earliest varieties. In passing, it may be well to give a caution against cultivating any northern variety for domestic use in winter. Owing to the length of our seasons they arrive at maturity too soon in the fall to admit of being kept for that purpose.

It may almost be said that lower Virginia is the home of the sweet potato, for nowhere does it attain greater perfection. It grows to a large size, is rich in saccharine matter, and commands good prices. It is even economical to raise it as a food for hogs. The Irish potato also succeeds well, but this remark is chiefly applicable to the early crop, which is usually shipped to the northern markets. In regard to the late crop neither in quality or quantity can we compete with the north.

Within the last two or three years some experiments have been made in the

culture of hops, the results of which are regarded as highly favorable. It is believed by those who have acquaintance with northern hop-yards, that this crop can nowhere be grown with more profit than in Virginia. It may be gathered, cured, and put in the market several weeks earlier than the northern crop; and new hops always sell at a higher price than those of the preceding year, or those of the same year at a later period in the season. A gentleman experienced in hop culture at the north, but now a resident of Petersburg, gathered last year upwards of 1,700 pounds to the acre, and shipping them early to New York, obtained $1 a pound for his entire crop, while the market price for the previous year's hops was 60 cents. Our forests and old fields abound in cedar, which is everywhere preferred for "poling" to any other material. Without estimating the value of this crop by the results of one, or, indeed, several experiments, it promises far better returns than anything that can be realized from cotton or tobacco, and deserves at least the favorable consideration of those who are tied down by the force of habit to one or two leading staples.

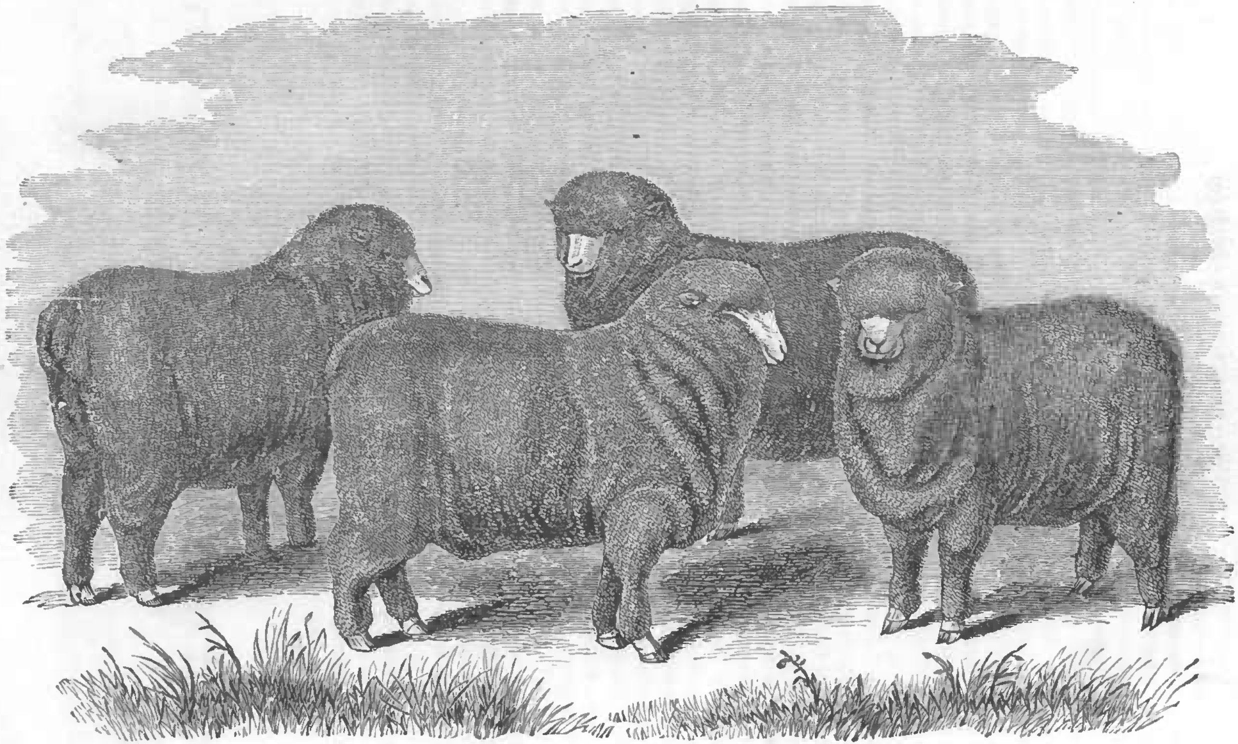
The raising of pork, which, in several of the counties of lower Virginia, has long been quite a profitable business, might be advantageously extended over the entire district. The bacon of Southampton county has the reputation of being the best in the State. It is made from the pork of our native breed of hogs, which are mostly of small size, not exceeding 150 pounds in weight. These hogs are reared in rather a primitive manner, running at large during the summer and fall, and feeding on the abundant mast of the forests. When the season for fattening comes around they are taken up and put in a pen, and corn-fed for a few weeks. Some farmers give a more generous treatment, by providing a field or succession of fields of the stock, or black-eye pea—there are two varieties—on which to turn their hogs, as soon as the peas begin to mature. This is about the first of August. The fattening properties of this food are fully equal to corn, while the cost of raising it is but trifling. At the same time it acts as a valuable improver to the soil. What with the straw or haulm, and the droppings of the swine, the land is left in a fine condition for wheat. It may also be said of the pea, that it has been used as a green crop for fattening, being second only to clover in its value for that purpose. It is, furthermore, a profitable crop to raise for market, being worth at the present time $3 per bushel, and seldom less than $2. A fair product is from 15 to 20 bushels per acre.

Another crop, coming under the same classification as the pea, and for which these soils are admirably adapted, is the navy bean. It is of easy culture, though requiring a better preparation, and has produced as much as 50 bushels per acre. It is now selling for $4 a bushel—rather above the average price—but as it is always in demand, the market is not likely to be overstocked.

The ground pea, or pea-nut, is another plant of easy culture, though, to raise it in perfection, the land should be dressed with either marl or lime, or with ashes, otherwise the pods prove abortive, or, in common phrase, are nothing but "pops." Under careful and judicious management the yield is 50 or 60, and from that to 80 bushels per acre, worth from $1 50 to $2 50 per bushel. The market price at this time is $2 25.

Now all these ought to be made sources of revenue on every farm, and if the writer has been guilty of no exaggeration, they would compare most favorably with any profit that can be derived from cotton or tobacco, even where these staples command the highest prices. The only advantage possessed by the latter is that they are capable of being put up in a more compact form, and transported to market with less trouble and expense. But as an offset to this the income derived from them comes in only once in 12 months, while the same amount of labor, divided among the articles enumerated would, it cannot be doubted, not only be rewarded by much larger returns in the aggregate, but the proceeds would be flowing in from time to time, affording the farmer the advantage of meeting the expense of labor as it becomes due, without the annoyance of falling into arrears, and being harassed by importunity for payment.

PLATE XXVII.



INFANTADO EWES.

Owned by ROLLIN J. JONES, West Cornwall, Vt.

Eastern Virginia, it is admitted, is not a grass country, and until the present system of agriculture is essentially modified, it can scarcely be expected that much improvement will take place in the breeds of cattle and sheep. Hitherto they have ranged much at large, cropping the natural herbage of the fields, which at some seasons is very good. But the cattle are prone to contract bad habits; they never attain full size, and it is not in the nature of things that they should show distended udders. If they had the benefit of good pasturage, and were more carefully attended, a very marked difference would soon be visible. At any rate, they must for a long time form our chief, if not only reliance, from the fact that all cattle from a distance are extremely liable to be attacked by a fatal disease known as the "distemper." That they are susceptible of improvement is evident from the fact that in the neighborhood of our cities they attain to fine proportion and become good milkers. The sheep, also, are altogether of the native stock, but they are healthy, and, in fact, are not known to be liable to any disease. The difficulty regarding the introduction of foreign cattle does not apply to sheep, but they have a formidable enemy in the number of dogs in almost every part of the country.

Although the soils of eastern Virginia are not naturally so favorable to the production of the cultivated grasses as those of a stronger texture, they are greatly improved in this respect by the application of lime or ashes. But we have the promise of a valuable accession to the list, and a species which will grow freely on all our soils, in the Japan clover *(Lespedeza striata,)* which has already extended over large districts in the more southern States, proving itself to possess extraordinary merit, both for fodder and grazing. It is not properly grass, but belongs to the leguminous family, like clover, to which it is nearly allied. From all the information which the writer has been able to obtain, both from published accounts and private correspondence, he is led to believe that this plant, so lately brought into notice, is destined to prove an inestimable blessing. It flourishes even in impoverished soils, and may come, in the course of time, to take the place of the unsightly brown sedge, which now disfigures so much of our country. At any rate it is worthy of experiment, and our farmers should take measures to procure at least a small quantity of seeds.

In fine, nothing is wanting to make the whole of this region almost like a garden but to divide it into farms of moderate size, to be occupied by an industrious and intelligent population. At this time not more, perhaps, than a tenth of the surface, if so much, is in actual cultivation, and the planters are so crippled in their resources that they would gladly sell off, at moderate prices, large portions of their now unmanageable properties.

HISTORY OF AMERICAN INVENTIONS FOR CULTIVATION BY STEAM.

BY PROFESSOR J. BRAINERD, (EXAMINER IN THE UNITED STATES PATENT OFFICE.)

We learn from the "Abridgments of the Specifications relating to Steam Culture" (in England) that on the 17th day of January, in the year of our Lord 1618, a patent was granted to David Ramsey and Thomas Wildgosse for a machine which the patentees quaintly describe as—

Newe, apte, or compendious formes or kinde of engines or instrumente and other pfitable invençions, wayes and meanes for the good of our commonwealth, as well as to ploughe grounde without horse or oxen, and to enrich and make better and more fertill as well barren

peate, salte and sea sande, as inland and upland grounde within our kingdomes of England and Ireland, and our domynyon of Wales, as also to rayse waters from anye lowe place to highe places for well watering of cittyes, townes, noblemen's and gentlemen's houses, and other places nowe much wanting water, with lesse charges than ever hath bene heretofore; and to make boates for the carryage of burthens and passengers runn vpon the water as swifte in calmes, and more saff in stormes, than boate full sayled in greate wynes.

This was the sixth patent granted in England, of which we have any account, and the first one in which the great power of steam was put into requisition for the purpose of assisting in the cultivation of the soil.

The cultivation of land is marked by three epochs. The first, in the primitive age of mankind, was performed entirely by hand labor. In the second, that most valuable and ancient implement the plough was drawn by domesticated animals. This practice has prevailed to a greater or less extent in all civilized nations, has extended over a period of several thousand years, and is still the prevailing practice.

So far as history gives us any information, the implement referred to at the head of this article was the first attempt at steam culture—the first effort of man to bring the great power of steam into requisition in the cultivation of the soil; and this effort, concerning which the patentees were so confident of success, marks the dawning of the third epoch in the cultivation of the earth.

It would be out of place in this article, which chiefly relates to the use of steam as a motive power in the cultivation of the soil, to devote much space to the history of agriculture, or to dive deeply into the stream of facts concerning the ancient methods of tillage.

In the early ages of man his nomadic life rendered agricultural pursuits to a great extent impracticable; in fact, with a sparse population, in a tropical or temperate climate, the spontaneous production of the earth rendered it unnecessary, and as the population of the globe was confined to those regions where the products of the soil grow most freely, and where the abundance precluded the necessity for the exercise of that invention and skill now required to bring forth from the bosom of mother earth that daily bread which our Creator decreed should be earned by man by the sweat of his brow, the necessity for the investigation of those subjects that now demand his attention was not felt.

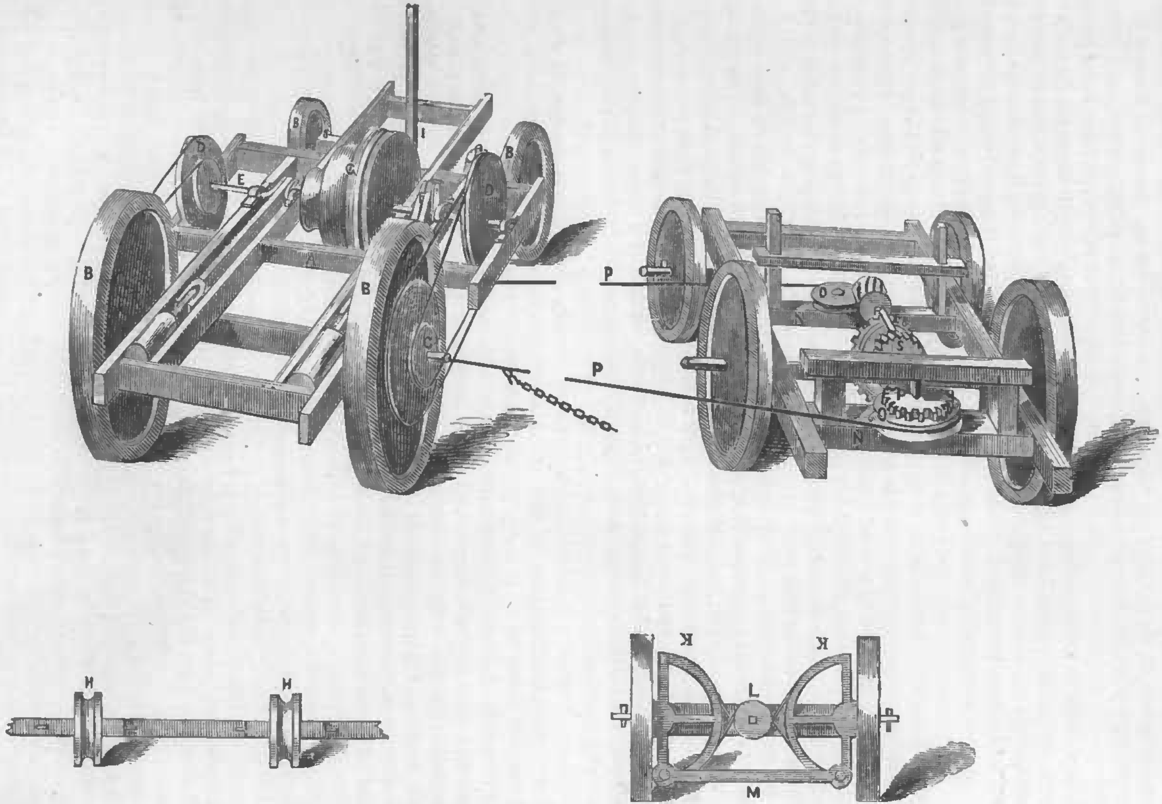
Antiquarians are agreed that the earliest implement used for the cultivation of the soil was of the pick kind. A medal of the greatest antiquity, dug up at Syracuse, contained an impression of such an implement, and its progress until it became a plough has been recognized in a cameo published by Menestrier, on which a pick-like plough is drawn by two serpents. (Loudon's Ency. Ag., p. 5.)

Various other relics of antiquity contain similar representations. There is reason to believe that the art of agriculture was carried to a high degree of perfection in ancient Egypt, and that there was a corresponding improvement in the implements used in culture, but to what extent other power than that of human hands was brought into requisition we have no means to determine.

As the population of the earth increased, the necessity for a more careful tillage became apparent, and its importance cannot even now be overestimated. No limit can be assigned to the increase of population unless it be from the want of means to sustain animal life, and hence it follows that with an increase of human life, there must be a corresponding increase of the means to support that life.

The application of steam power to the propulsion of machinery for the purpose of travel and transportation has been proved a success far beyond the most sanguine expectations of its warmest advocates. Animal power cannot compete with it. It is as untiring as the sun in his course, and when its day's work is done it needs no rest, but is ready at a moment's warning to renew its task. That it is destined to supersede animal power, even in agriculture, there can be no doubt. As the earth becomes more densely inhabited it becomes more and more apparent that the available surface must be made to yield its 30, 60, or 100 fold in order that the increasing millions shall be supplied with food, raiment and habitation.

FIG. 1.



E. C. BELLINGER'S APPARATUS. (Patented November 19, 1833.)

Our wants, too, have grown with our numbers. Our limbs need coverings more complicated and costly than the skins wherein our primogenitors were wont to envelop their sturdy frames; our mansions no longer content themselves with simplicity, but cry out for sumptuousness and elegance; the speed of the faithful horse and enduring camel is forgotten, when compared with that of locomotion by steam. Therefore, we say to one patient tiller of the soil, "Leave thou the plough and furrow, and betake thyself to the spinning-wheel and loom; weave us fine garments." To another, "Drop thou the reaping-hook for a new field of labor; build us high abodes." To a third, Forsake thou the plant and tree; take the elements that God has given us, and develop their latent powers. Delve deeply into the earth, and bring forth her treasures of iron and coal; construct the mighty engine; chain the lightnings of heaven, and compel them to do thy bidding, carrying tidings of peace and plenty to the ends of the earth.

There is little doubt that with the natural advantages of soil and climate, with a proper system of cultivation, the continent of North America would be capable of sustaining comfortably the entire present population of the globe. Even now, with all its imperfections in culture, it furnishes bread for millions in Europe.

No portion of the globe is better adapted to steam culture than the broad prairies of the west, and it is upon these plains that the great problem of steam culture must be solved.

Since the granting of the patent referred to at the beginning of this article, the efforts to obtain a substitute for the common plough, or the means for operating it, have been neither few nor unimportant. It were an arduous and perhaps a tiresome task to recount the various forms in which inventors have embodied their ideas of utility in this respect. The desiderata in this case, as perhaps in every other, have been to work well and work cheaply. Perfect success has not yet been attained, but there may be now little pattering feet which will walk in the road thereto.

For convenience I shall, in this article, divide the various modes of steam culture into classes, and assign to each a title the relevancy of which will appear as I proceed.

The hauling plough, so called because the engine that operates the plough is placed upon one side of the field, and moves along a headland; the ploughs, generally a gang with two sets, turn furrows in the same direction in moving back and forth over the field. Upon the opposite side of the field is placed a movable capstan or windlass, which is moved forward upon a headland, and the ploughs are drawn back and forth by means of wire ropes or chains, as shown in figure 1. At each set of furrows the engine is moved forward upon the headland upon one side of the field, and the capstan upon the other, the width of a set of furrows, when the ploughs are drawn again across the field.

This method of cultivating, or working the land by steam power, was first patented in the United States by E. C. Bellinger, of South Carolina, November 19, 1833, but from some cause the invention never went into general use.

About the year 1854 John Fowler, of England, improved upon this general plan of Bellinger's, and was so far successful that a number of machines were put in operation. In 1856 and 1857 Fowler took out patents in the United States for his improvements, but up to this date but two of them have been brought into use in this country. As a special encouragement, Congress at its last session passed a bill allowing the introduction of steam ploughs free of duty.

Another method of steam culture has been attempted, in which the engines are designed to travel over the field, drawing the ploughs behind them, usually in gangs, and many patents have been granted for alleged improvements in this mode of culture. Among the earlier of these adventurers may be named Henry Corning, 1850; David Russell, 1855; Judd Stevens, 1858; J. D. Howell, 1859; B. Crawford, 1857, and many others.

Their efforts at improvement have been directed chiefly to the construction of

an engine that was capable of traversing the field, and drawing a gang of ploughs; but hitherto insurmountable difficulties have been experienced. It has not been found impracticable to construct an engine capable of running over a common road, but in a cultivated field, where the soil is soft and yielding, it has been found that nearly the entire power of the engine has been expended in its own propulsion, and hence its inability to overcome the resistance of the ploughs.

The cause of the failure of traction engines to perform their work in ploughing can be explained upon the following hypothesis:

We will suppose that an engine of 10-horse power, fully equipped for the field, will weigh eight tons. If it has four driving wheels of one-foot tread each, there will be 48 inches of effective contact with the earth. Now, a single furrow, 12 inches wide and 10 inches deep, will present a resisting surface of 120 square inches; consequently the resistance, even with a single plough, would be greater than the applied traction power of the engine.

But a team of ten pairs of oxen would be able to turn a furrow of prairie turf of the width and depth named, say at the rate of an acre a day for a single plough. Ten pairs of oxen would be equal to a 10-horse power engine, and their united weight, when fitted for service, would equal that of the engine—say eight tons. The foot of an ox has an effective contact with the earth of about eight inches, and we may safely estimate that one-half of the number of feet while under draught will be constantly in contact with the earth; hence we have $40 \times 8 = 320$ inches; that is, the eight tons' weight of the team is distributed over a surface of 320 inches of contact, to balance against 120 inches of resistance in the furrow.

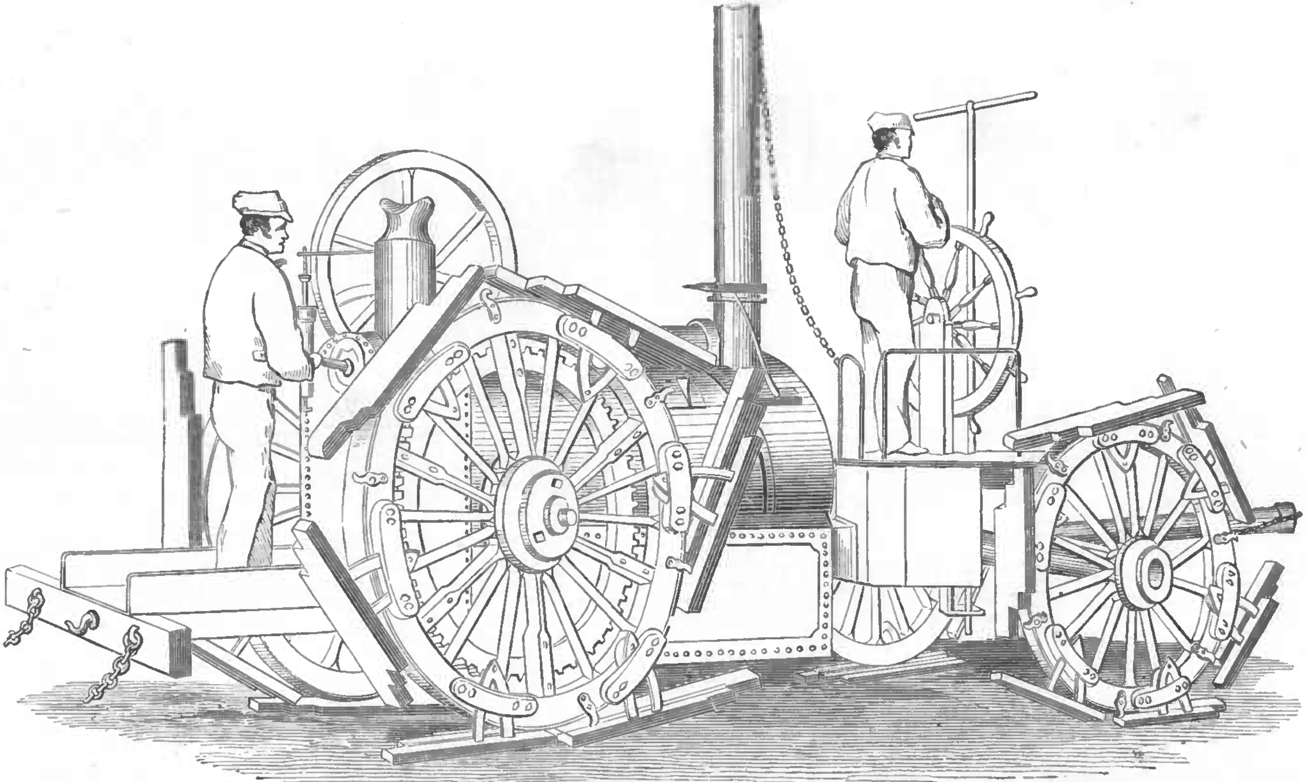
An acre of land contains 43,560 square feet. A team turning a single furrow 12 inches wide and 10 inches deep will, upon an average, travel one mile in an hour. A furrow one mile long and 12 inches wide contains 5,280 square feet of surface, and hence it follows that the distance travelled by a team in ploughing one acre, with a width of furrow of 12 inches, will be a little over eight miles, which is about a fair day's work.

A steam engine of a stationary power equal to that of 10 pair of oxen must, to be equally effective for draught, have a corresponding amount of contact with the earth; that is, the weight of the engine must be distributed over 320 superficial inches of surface in order to be equal to a team of the same weight with the same amount of earth contact. But an increase of surface contact would give a corresponding increase of power within certain limits—say to double the amount; that is, if an engine could be so constructed as to have 640 inches of traction surface for eight tons' weight, it would be capable of doing twice the amount of draught labor that it would with half that amount of surface.

A word about the comparative cost of feed and fuel may not be out of place. A team must have periods for rest and recuperation equal to one-half of the ordinary hours of labor, aside from the legitimate repose of night. But it is not so with a steam engine. It is constant and untiring in its labors; it needs no repose, but is ever ready for its task. An ox team cannot work upon an average more than 8 hours in 24. A single ox will consume as food the value of one bushel of corn a day, which would equal 20 bushels for the 10 pair every 24 hours. A steam engine of good construction, and of 10-horse power, can be run during a day of 16 hours by the consumption of an equal amount of corn as fuel; at least I am assured of this fact by an engineer of large experience in building and running locomotives. An engine of the power named, with a traction surface of 640 inches, according to the foregoing comparison, would be able to draw two ploughs, each cutting a furrow a foot wide and 10 inches deep, at the rate at least of one mile an hour, equal to the speed of an ox team, and by a relay of hands to work it could be run 16 hours in a day, ploughing four acres instead of one, (by the team,) with no greater consumption of food-fuel than would be required by the team. And there is a further consideration in favor of the use of steam in the business of cultivation. A team needs constant care, and costs the most to feed it when it

PLATE XXIX.

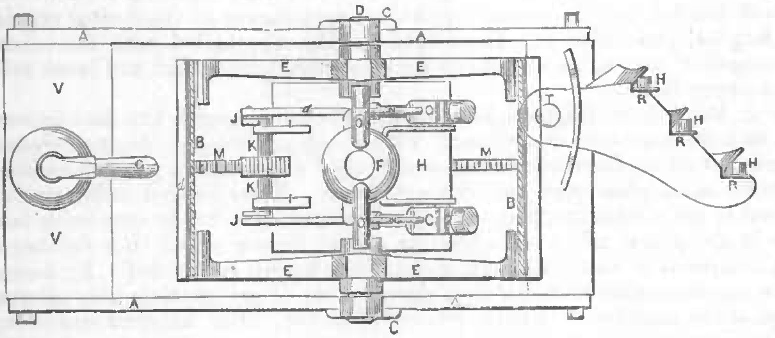
FIG. 2.

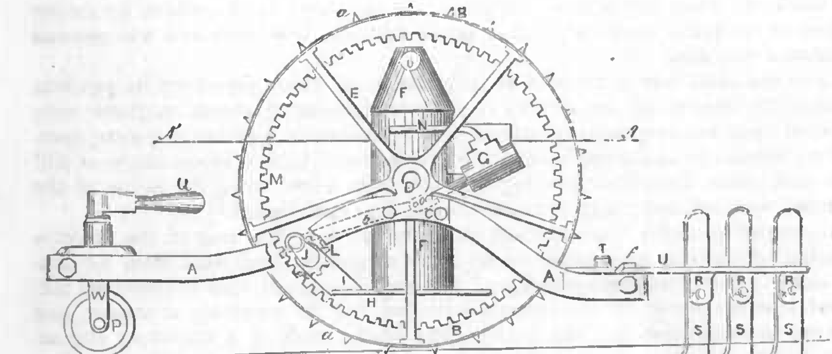


J. BOYDELL'S INVENTION. (Patented in 1846.)

PLATE XXX.

FIG. 3.





T. H. BURRIDGE'S IMPROVEMENT. (Patented July 31, 1860.)

is of the least service. The short duration of animal life, and the risk of premature death, add not a little to the cost of animal power.

The method of steam culture proposed by Bellinger, and subsequently improved upon by Fowler, of England, is probably the most feasible that has been attempted. But this plan, under the most favorable circumstances, is open to objections, and in many situations it cannot be brought into operation. If a traction engine could be constructed upon the plan hereinbefore indicated, it would supersede Bellinger's and Fowler's plan of dragging the plough across the field by long ropes.

In the earlier attempts at steam ploughing the great difficulty in the way of success, as before stated, was *traction;* and various plans were devised by inventors, both English and American, for the accomplishment of the desired object. The English early tried two broad-tired driving wheels, but with the necessary weight of the engine the wheels sank too deeply into moist and loose soil, and of course failed.

Mr. J. Boydell, of England, in 1846, constructed an engine that laid its own track as it travelled over the ground. This he accomplished by hinging together a number of stout, flat wooden rails, so that they would form a polygon outside, and in the same plane with the driving wheels. These hinged rails were so attached to the wheels that they revolved with them, each rail in turn being laid down in front and taken up behind its proper driving wheel, thus forming a track, composed of an endless belt of short rails hinged end to end. By means of this ingenious expedient Mr. Boydell was able to get traction, but, unfortunately, at the sacrifice of a great amount of power. The annexed engraving exhibits clearly the construction and operation of these traction wheels. In 1854 Mr. Boydell made some improvements in his machine, but for some cause it has never been introduced into general use, but, like many others of its kind, has been laid aside.

About the year 1858 Mr. Thomas H. Burridge, of St. Louis, Missouri, a man of remarkable genius, invented and built a traction steam engine, intended chiefly for field culture. It consisted, as will be more fully shown by the engraving, of a large cylinder, about 10 feet in diameter and 10 feet in length, and made of heavy boiler iron. A shaft was supported in the centre by means of rods or spokes at each end, and at equal distances from each end was secured an interior cog gear.

Upon the shaft was suspended an iron platform, which preserved its pendent position by reason of its gravity. Two reciprocating steam engines were mounted upon the suspended platform, and by means of a pinion cog-gear, operated by cranks from the engines, which cranks were placed at an angle of 90° from each other, the pinion gearing into the main wheel upon the inside of the cylinder, rotation and progressive movement was established.

A gang of ploughs was attached to a framework in the rear of the traction cylinder, to which it was connected by arms extending backward from the central shaft. The practical operation of this engine showed that it possessed sufficient traction power for the purpose intended, but its unwieldy character, and its want of adaptation for the performance of the work of a stationary engine, formed obstacles to its introduction into general use.

In 1851 Messrs. Calloway & Purkis, of England, with a view to improvement in steam culture, constructed a neat locomotive, with two main traction wheels of 18 inches' tread, with a truck forward for a steering apparatus.

The engine differs in no important particular from those previously constructed in England designed for common road traction. To the rear end of the locomotive frame, as shown in the figure, is connected transversely an iron frame, 18 feet long, supporting at each end an axle, on which are keyed three cast-iron chain wheels, around which is passed the endless chain that carries the ploughs, to which rotation is given by the power of the engine, so that a relatively quick

motion is given to the endless chain and attached ploughs as compared with the progressive movement of the locomotive.

There are four ploughs attached to the chain, each capable of cutting a furrow nine inches wide, and, consequently, every entire revolution of the chain, with its ploughs attached, turns up four furrows, 18 feet long each, while the locomotive will have advanced progressively 36 inches. This operation being continually repeated, the locomotive will leave behind it ploughed land 18 feet broad, and cut to any required depth, with a remarkable degree of accuracy. The lines of furrows thus cut will be slightly oblique to the line of forward movement of the engine, but may be made at right angles, by a slight adjustment of the transverse frame.

One patent has been taken out in the United States, by E. G. Otis, for improvements in this steam plough, but for some cause unknown to the writer it has never been put in successful operation.

The plan invented by Bellinger, commonly called "*cable traction*," and subsequently improved upon by Fowler, consisting chiefly in his balancing gang plough frame, has undoubtedly been received with more favor, and has gone more extensively into use than any other, especially in England.

We are informed that there are now about nine hundred of them in operation in that country, and that one manufacturing establishment turns out four every week. Part of these are sent to the continent, some to the East Indies, and two have been imported into the United States, one of which is in use in Illinois, and the other in Louisiana, and, so far as known, are successful.

The recent act of Congress admitting steam ploughs to importation free of duty for one year, undoubtedly had reference to the Fowler plough; though others have been constructed and used in England, among which was one put in operation by Williams & Smith, in which the engine was placed at the corner of the field and the plough caused to traverse *around* it by means of a cable and capstans placed at the other three corners, and moved inwards as the ploughing progressed. It will be seen that this plan differed from Fowler's only in this, that it went around the field; at every set of furrows the engine and capstans moving inward until the work was completed, while that of Fowler's traversed back and forth between headlands, upon which the engine and capstans were moved forward.

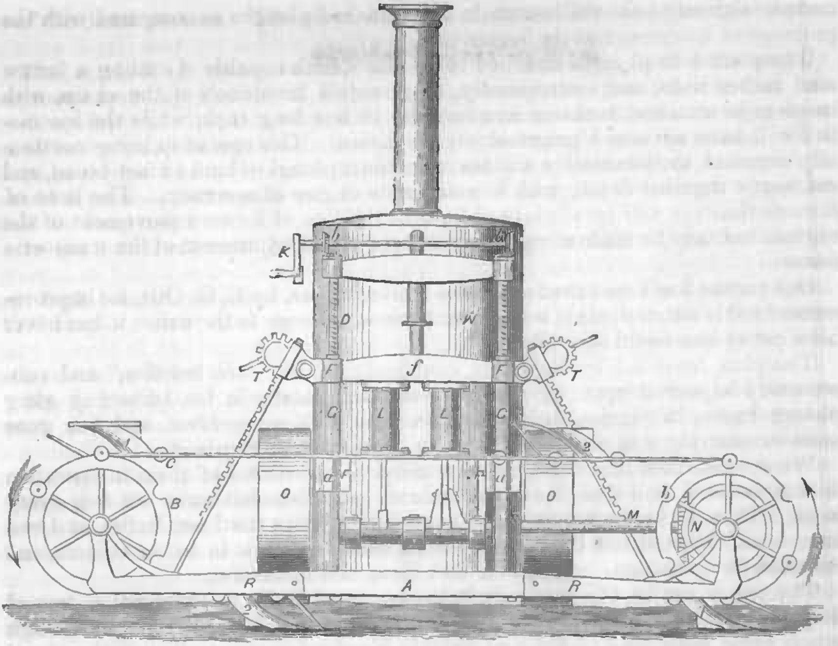
Among the steam ploughs invented in this country, that of John W. Fawkes, of Lancaster, Pennsylvania, has probably attracted the greatest attention. The accounts that have been published of its power and performances seem, however, almost fabulous. Certain it is that the expectations and promises of its friends have not been realized, although ten years have elapsed since the date of his (Fawkes's) patent.

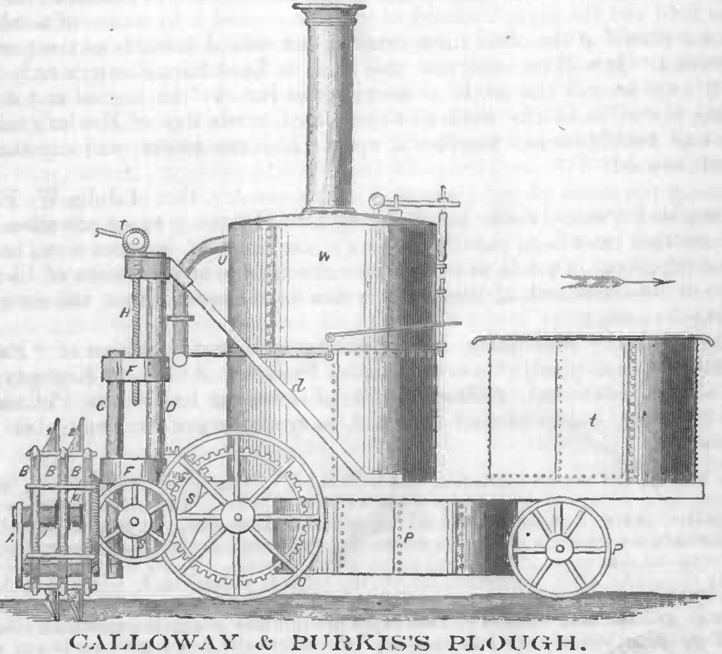
The following description of the construction and operation of "Fawkes's American steam plough" was written by Professor Alfred L. Kennedy, president of the Polytechnic College of Philadelphia, at its trial in Philadelphia, July 20, 1859, and published in the Albany Cultivator for September of the same year:

The body of the engine consists of one horizontal, quadrangular frame of iron, about 12 feet long by 8 wide, which rests upon the axles of a roller. This roller, which is six feet in diameter, and six feet long, is the driving-wheel of the engine. In front of the roller, and bolted within the frame, is the boiler, which is upright, surmounted by a dome and pipe, and so constructed that steam may be got up in fifteen minutes. Thirty minutes, however, are usually required. Over and behind the driving-roller is a water tank, which is of the entire width of the engine frame, contains 12 barrels, sufficient to supply the boiler for five hours, and is so situated that when it and the boiler are full they counterbalance each other upon the roller. Attached to the frame in front of the boiler, and tapering forwards and slightly upwards like the bow of a boat, is a sheet-iron receptacle for coal. Here is also a seat for the fireman, the whole bow resting on two guide wheels, of 15 inches' tread, and four feet in diameter. Bolted to the under side of the frame, as frequently seen in locomotives, and on each side of the upright boiler, are the cylinders, each nine inches' diameter and 15-inch

PLATE XXXI.

FIG. 4.

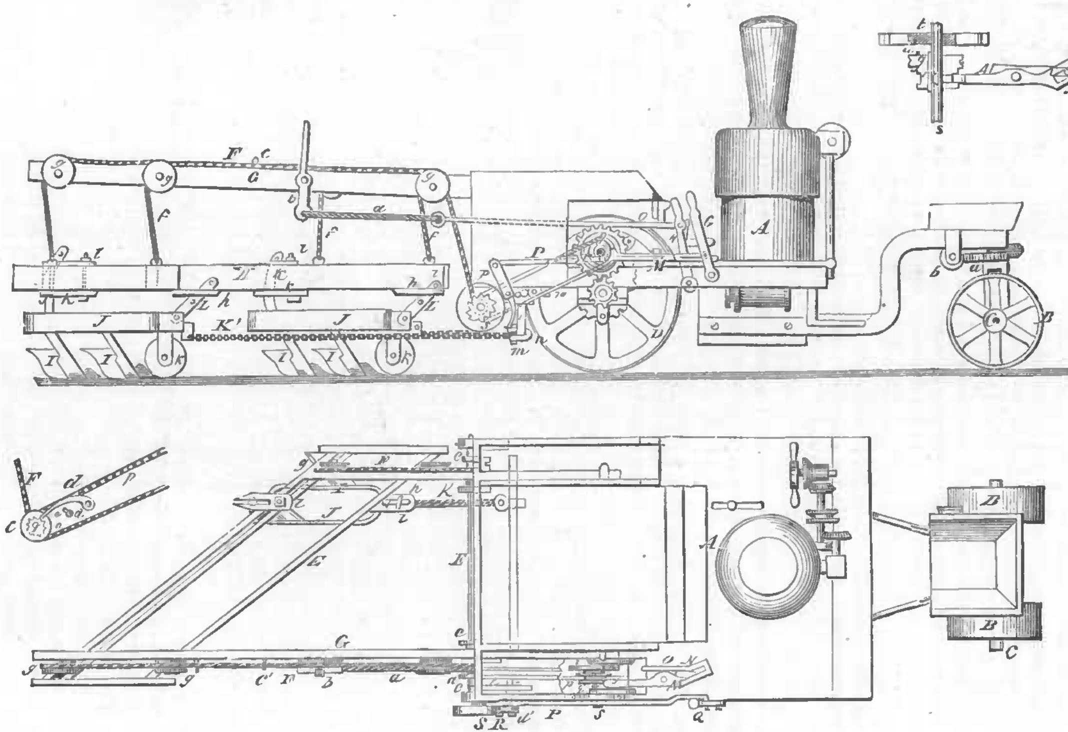




CALLOWAY & PURKIS'S PLOUGH.

PLATE XXXII.

FIG. 5.



J. W. FAWKIS'S PLOUGH. (Patented December 13, 1859.)

stroke, the piston rods of which are so geared to the crank of the roller that it revolves once for every six strokes of the piston. Great regularity of motion, increase of motive power, and control over movement of the engine backwards and forwards are secured by this arrangement; while the guide wheels, which may be turned at pleasure by a steering wheel in charge of the engineer, almost at right angles under the bow of the machine, permit it to turn in a circle, the radius of which is equal to the length of the engine, 18 feet. By a small independent "donkey engine," which is placed between the tank and boiler, the latter may be filled from the former, or the tank itself be supplied through a hose from a well or brook.

Into the beams projecting from the rear of the engine pulleys are let, over which chains pass, whereby a gang of eight 14-inch prairie ploughs is suspended; a wheel on the beam of each plough regulates as usual the depth of the furrow, and the whole gang may be raised or lowered by a lever within reach of the fireman, who, with the engineer, constitutes the entire force needed to work the engine and ploughs.

The machine was tested on timothy sod which had not been ploughed for seven years. At a given signal from the whistle the fireman lowered the ploughs to the ground, which having entered, they were drawn forward up an incline of about seven degrees. They were lifted promptly at the margin of the land appropriated to the trial, the machine turning easily; again they were lowered, and the ploughing resumed in as short a time as could have been done with a single plough and a pair of horses.

The mean rate of speed was four miles an hour, and the united furrows were nine feet four inches wide; a strip four miles long, nine feet four inches wide, equals 197,120 square feet, which, divided by the number of feet in an acre, gives almost exactly $4\frac{3}{10}$ acres per hour.

In the Albany Cultivator for August, 1859, we find the following editorial statement relative to the trial of Fawkes's steam plough, at the time and place before alluded to:

The trial of a new steam plough recently took place near Philadelphia. It is the invention of Mr. Fawkes, of Lancaster. It is attached to an engine 18 feet long, 7 feet wide, and weighing seven tons, with upright tubular boiler. The engine rests on an iron drum six feet in diameter, and six feet long, inside of which is an axle extending from end to end. The ploughs are eight in number, and are adjusted so as to lift up when the machine is turning at the end of a furrow, being turned and backed with as much ease as a common carriage. The two fore wheels are iron drums, $3\frac{1}{2}$ feet in diameter, and 15 inches face, to prevent the engine from sinking too deeply into the ground. The machine turned over eight furrows at a time, each a foot wide and of ample depth, going at a speed that showed it capable of ploughing several acres per hour. The work was perfectly satisfactory to the committee and spectators.

Past experience has pretty clearly demonstrated that our traction engines have thus far failed to afford the requisite power to drive the common plough in an economical manner. Let us then further endeavor to show the cause of failure, and in so doing we shall have advanced one step towards correcting the evil.

Fawkes's locomotive was of the high-pressure kind, and carried two steam cylinders of nine inches diameter each, with fifteen inches stroke, consequently the maximum force was about eleven horse power. The weight of the locomotive was seven tons, about five of which rested upon the journals of a traction cylinder six feet in diameter and six feet in length. The amount of effective earth contact was, therefore, 72 inches.

Eight yoke of oxen, weighing in the aggregate eight tons, (much below the standard weight,) are capable of ploughing eight furrows of the width and depth named, at the rate of 88 feet per minute, or one mile per hour, and in doing this they have a traction contact with the earth of 256 inches. Now, without allowing any deduction for the consumption of power by the increase of speed from one to four miles per hour, it would require 1,024 inches of contact, or 32 pairs of oxen, to drive eight ploughs at the rate of four miles an hour.

The resistance offered by one plough, in sward ground like that upon which Fawkes's plough was tried, is about 400 pounds. It requires one horse power to raise 33,000 pounds one foot per minute; therefore, to raise 400 pounds (the draught of a single plough) one foot in one minute will require one eighty-second (1-82) of a horse power. Now, 3,200 pounds is 8 times 400 pounds, (the draught of Fawkes's eight ploughs,) hence it will take eight eighty-seconds (8-82) to move 3,200 pounds one foot per minute.

Fawkes's ploughs were said to move at the rate of four miles per hour, which is

352 times one foot per minute; therefore it will require three hundred and fifty-two (352) times eight eighty-seconds (8-82) of a horse power to drive his eight ploughs four miles per hour, which is 34½ horse power, about 23 more than the maximum of Fawkes's engine, and this without subtracting anything for pro pelling his engine of seven tons weight.

It therefore follows that Fawkes's engine, in order to come up to the standard of an ox team of equal tons weight, should have had an increase of traction contact of 184 inches over the 72 of the driving wheel, thus equalling 256 inches, (which is that of the team under draught,) about a hundred less than the estimated power of Fawkes's engine required to develop its full working capacity of 11 horses. Hence it follows that Fawkes's locomotive should have had a traction surface of 352 inches, instead of 72, and to this deficiency may be attributed his want of success.

There can be no reasonable doubt that steam power, with more perfect means for its application, can be made profitably available for the purpose of tillage, but the locomotive is yet to be constructed that is capable of yielding the results sought.

Before closing this article I shall offer some suggestions relative to such construction, with a view to a more perfect application of steam power in this direction. Among the various appliances to overcome the difficulties from want of traction may be mentioned the revolving screw, operating not unlike the screw propeller in steamships. But experience has shown that the friction of the blade upon the soil consumed too much of the power of the engine to make its use suc cessful as a means of propulsion. A patent was granted to J. R. Gray, in 1857, for a machine of this character.

In 1863, A. W. Hall, of St. Louis, Missouri, took out a patent for a steam plough, so nearly allied to cable traction as to render it worthy of notice, in which the points of novelty were directed to means for overcoming the hitherto almost insurmountable difficulties experienced from want of *traction*. The locomotive, as will be seen from the engraving, consisted of a framework, supported upon four wheels, of suitable strength to bear the weight of the boiler and other parts of the nachine. As he did not depend upon the weight of his locomotive for traction, t was built as light as was consistent with the required power.

There are two sets of rollers placed horizontally in pairs, transversely to the frame of the machine, and rotated in opposite directions at a uniform speed, by means of two sets of cog gears, which are driven by two reciprocating engines, located upon opposite sides of the boiler. The rollers are grooved in the centre to receive a rope which passes between them, and is held from slipping by the strong bite of the rollers. The rope is anchored at each side of the field to be ploughed, the anchors being moved forward on head lands as the ploughing progresses.

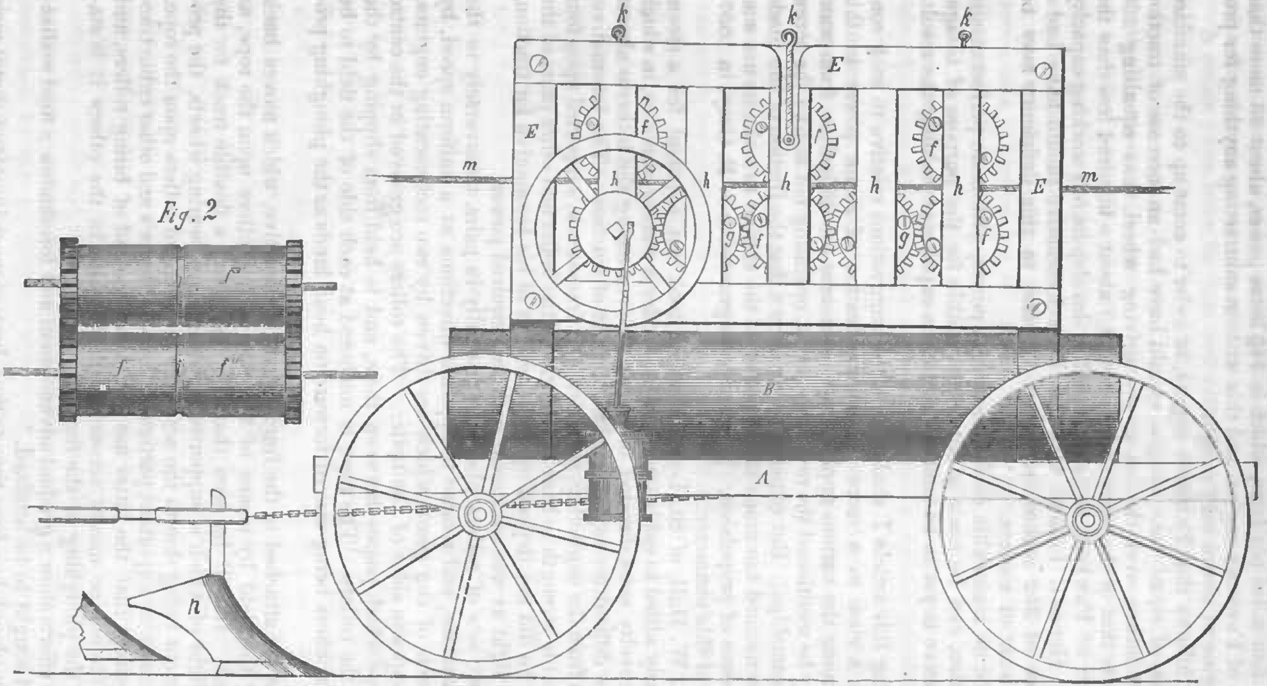
The ploughs are attached to the frame of the locomotive, which moves back and forth over the field by means of the bite of the rollers upon the rope, as before described. It will be seen that the rope forms a flexible track for the engine, the weight of which is supported upon ordinary bearing wheels, the progressive movement being due to the action of the grooved rollers upon the rope. This plan differs in no important particular from Bellinger's and other cable traction ploughs, except that the latter use a windlass instead of biting rollers, and that in Hall's the engine moves across the field, while in the others it is stationary during the ploughing of the furrow.

All of these efforts show a gradual advancement and foreshadow a final realization of the end sought to be attained.

The common plough has, from time to time, been so much improved that it may now be accepted as the most perfect implement for preparing the ground for a crop. No other can compete with it in regard to the amount and quality of the work performed, taking into view the time and expenditure of power. If, instead of

PLATE XXXIII.

FIG. 4.



A. W. HALL'S IMPROVEMENT. (Patented April 21, 1863.)

futile attempts to invent and construct implements intended to supersede the plough, the inventor should direct his attention to an improvement of the means for its economical use by steam power, we might hope for results commensurate with the importance of the subject.

A steam locomotive for farm purposes should be so constructed as to be available for other purposes than simply ploughing and cultivating the soil. Its failure in this regard would be fatal to its profitable employment.

With a view to obviate the difficulties hitherto presented in the use of steam as a motive power in cultivation, numerous efforts have been made to construct machines and implements that would perform the desired work in preparing the soil in a better and cheaper manner than the plough.

It is not my purpose to enter very largely into a description of this class of inventions. The saving of power by the means proposed is more imaginary than real, for it should be borne in mind that the soil must be moved to the extent required, whatever may be the instrumentalities brought into operation.

The spading machines first invented were made to imitate, as nearly as possible, the same kind of work as that performed by the common spade when operated by human hands.

A series of spades with long handles, mounted upon the rear end of a frame supported by traction wheels, were caused in regular succession to enter the earth and throw up the soil as the machine moved over the ground. In these, the power to operate the spades was derived from the traction wheels, by means of a series of cranks or cams, and the operation was the same, whether the machine was propelled by animal or steam power. In either case the power required is the same, and cannot, in the nature of things, be less than that consumed in moving the same amount of soil by means of the common plough. The idea that the spades, by working backward, assist in the forward movement of the machine, is simply hypothetical.

Another question of no small moment is, that by no system of machine spading can the herbage be turned so completely under as by the plough. Spading machines have not hitherto proved successful.

Another device, very nearly allied to the spading machine, consists of a rectangular frame supported upon traction wheels, with a revolving cylinder armed with spirally arranged shares mounted upon the rear end. This, on being put in motion by the progressive movement of the machine, digs up the soil and throws it back in a comminuted state. In some the cylinder is armed with spikes, and acts upon the soil like a revolving harrow.

In still another form the spading device consists of a large, heavy cylinder, revolving freely on journals, either within the frame of the locomotive, or attached behind it by hinged arms, the cylinder being armed with narrow-curved blades similar to a ditching spade, and as the machine moves over the ground, the weight of the cylinder presses the blades deeply into the soil, which is broken up and thrown loosely into the rear as the machine progresses. In some machines the traction cylinder is armed with hinged blades that are thrust out and retracted by means of cams, with a view to imitate the use of the spade by hand.

The last species of these diggers which I shall particularly notice consists of a rectangular frame mounted upon traction wheels. To the rear end of the frame a series of vertical shafts are secured, to which is given a rapid rotary motion, by means of a train of cog gears.

To the lower end of these shafts are attached cutting blades, which, on being lowered into the soil, by their rapid motion, cut and disintegrate it to the depth required, by the progressive movement of the machine leaves behind it the mellowed earth.

Although in the United States a large number of patents have been issued for machines and implements for steam culture, the efforts in that direction have not been crowned with success. The want of suitable adaptation in the devices

themselves, or the lack of power to drive them, is the probable cause of failure. A great majority of our farmers are men of moderate estates, and not possessed of means to enter largely into a series of expensive and uncertain experiments.

In England it is not so. There the leading agriculturists are possessed of large estates, and are, consequently, in a more favorable condition to bear the expense of costly experiments. There, too, in the most densely populated agricultural districts, the land is kept under a better state of cultivation than in this country, thereby rendering steam culture more available and profitable.

Here the virgin soil is soon exhausted by excessive cropping, and a new field of enterprise is sought. There the same fields must, from year to year, be made to yield the needed crop. Here the vast domain of unoccupied fertile ground invites emigration, and the necessity for a more perfect system of cultivation will not be fully felt until our wasteful and slovenly system shall have been exchanged for one that is based upon more rational principles.

Individual enterprises in agriculture must be merged into associative effort, at least so far as relates to the introduction of expensive steam machinery, for the purposes herein referred to.

When mowing and reaping machines were first introduced, it was not deemed necessary that every farmer of moderate means should possess one. A number would join in the purchase of a machine, and put it in charge of a man skilled in the art of using and keeping it in repair, and in this way a number of farmers could be served at much less expense, and with equal or greater despatch, than could have been done had every one owned a machine.

Thus it was with threshing machines—which were taken from farm to farm, and used and kept in repair by men skilled in the business; and thus it will undoubtedly be in the introduction of steam power for the purposes of cultivation. An engine, to become a profitable investment, must be so constructed as to be made useful in other departments of farm labor than merely ploughing and cultivating the crop. It must be made capable of adaptation for driving a threshing machine, sawing wood, grinding provender, churning, washing, pumping water indeed, almost all kinds of labor now performed either by hand or animal power

If steam ploughing is ever to be made practicable, if the steam engine is to become generally useful upon the farm, "it can only be so at a moderate expense. The errors in the attempts yet made in steam ploughing have arisen, perhaps, from making the steam engine too heavy, and on too large a scale."

That the steam engine is destined to supply the place of animal power, at least in a great degree, in agriculture, there can be no doubt, and thus effect a great reduction in the expense of working the land, and become a powerful instrument in augmenting the productiveness of the soil.

The following paragraph taken from a valuable work on the use of steam on farms, (The Farm Engineer, by Robert Ritchie, C. E., Edinburgh, Scotland,) is worthy of notice:

Having now enumerated a variety of different purposes to which the steam engine may be applied on the farm, and stated the simplest and most economical way of applying the first power to subordinate machines, any one who has paid even but slight attention to this subject must be convinced of the great capabilities of such a power; nor need any alarm be felt against the use of steam (as is often the case in diminishing human labor) when thus applied to farm purposes; as we may see that, in place of diminishing labor, the extended use must tend to increase the amount. No doubt it dispenses with manual labor for some purposes, but in most of these human strength is misapplied, and, it may be, health injured; but it brings forward many new forms of mechanical operations whereby the people may be employed. I am well aware that many intelligent farmers entertain a prejudice against the use of subordinate machines, from their supposed complications of machinery.

It must take time to dispel such opinions; but the best way to do so is by those who use such machines and modes of application, showing by their good management the utility, success, and safety which attend them. Then will the use of different machines be gradually extended, and what at first may have alarmed the farmer become a source of interest or amusement to him; and what at first seemed a difficulty in management will soon

become a matter of daily routine. There is, indeed, no class of men who know better the true value of economy than farmers, and they justly consider well and deliberately the nature of a declared improvement before they embark on it: but once convinced and satisfied of the advantages of any plan, there are none who are more gregarious in opinion and more ready to adopt it. It will never be the fear of a little extra trouble or danger, which may be almost considered imaginary, that will deter farmers from adopting steam in every variety of manner and circumstances on farms, if they are satisfied of its remunerative advantages. Perhaps in no branch of the arts is there a better scope for invention, and, perhaps, less risk of mechanical science not being duly appreciated than in agriculture, if a knowledge of its advantages be once realized.

It remains, then, to discover by what means such improvements may be made as will bring the great power of steam into general use in carrying forward the art that lies at the very foundation of all our national prosperity.

The implements of husbandry have reached a point of commendable utility, and we only need a corresponding improvement in propelling power to render their work eminently successful. The wants of mankind at the present day demand a solution of this question. The point to be gained in this direction is the construction of a locomotive steam engine that will take the place of animal power in the leading business of farm work, but more especially in the department of ploughing and cultivation.

That engines can and have been constructed possessing the requisite amount of power no one will for a moment question. The main object to be aimed at is to make them less unwieldy, and this can only be done by following out the indications of nature, both by the reduction of the weight of individual machines, and in the relative increase of traction surface.

STEAM CULTIVATION.

By D. S. Curtiss, Madison, Wisconsin.

From personal observation of the application of steam power in cultivation together with a careful and extended examination of numerous reports by inspecting committees and practical farmers in Europe, who have had large experience in its use, I am convinced that it can be adopted in this country with great facility and profit; and that it is the desideratum, the great thing now needed, to raise and advance farming to the highest scale of prosperity and dignity, in which men of the best minds, highest culture, and broadest views, will delight to engage and find scope for enlarged intellect and ambition. Pecuniary gain should not be the sole measure of benefits in estimating the value of any apparatus or system; the facilities and leisure for mental elevation and enjoyment, with the increased dignity and efficiency in the profession which will be promoted by its adoption, are legitimate and weighty results to be regarded in determining the question of approval.

The profession of agriculture is the foundation and support of all other industries, and consequently the most important of all; hence it should receive the encouragement of inventive genius and have all attainable aids of mind and machinery to make it useful, profitable, and attractive to the highest degree; everything practicable should be done to raise it from its present character of dull drudgery to its just and proud position among liberal and respected professions. The delights of brain-work must, to a greater extent, relieve the toil of physical efforts; mechanical or scientific power, which can suffer neither pain nor fatigue, should be made, as far as possible, to take the place of animal muscles, which do suffer pain and fatigue and become exhausted.

Improvements in agricultural operations must keep pace with the progress of other vocations, such as manufactures, commerce, and the professions. Nothing should be left undone which we can fairly effect, to increase the yield, cheapen the cost, and lighten the labor of obtaining the productions of the earth; we cannot render too cheap or too plentiful the necessaries of life; while, at the same time, the operations of their production should be made as attractive and respectable as possible, that intelligent minds may find as much inducement to engage in this as in any of the other pursuits of civilized life. Mind must be permitted more and more to predominate over muscular labor, and, as far as may be, machinery must take the place of animal forces in farm operations, as in other pursuits of civilization.

Unless the farmer keeps pace with the spirit of the age, uniting art with science, he will find himself in an inferior grade, where he will enjoy less of the blessings, treasures, and refinements of life, and endure more hard work than other classes; for the experience of all enlightened communities proves that the necessaries of life, as well as its luxuries, are cheapened and improved in the same proportion as the ingenuity of the mind guides the power of the muscles, and the mechanical powers supersede the animal forces.

STEAM CULTURE IN EUROPE.

Steam power has in Europe become extensively employed in farm operations generally, such as harvesting, threshing, and grinding grain, cutting feed, sawing wood, &c.; but the principal object of this article is to furnish a history, with the results of its application in the cultivation of the soil in different localities and on various kinds of lands, that parties may judge for themselves from their own standpoint and necessities whether to avail themselves of its use. It is not my purpose to advocate or favor any particular machine or system, but to state facts generally, and leave those interested to choose which, if any, tackle or system will be best adapted to their particular case.

I might multiply testimony upon the subject under a great variety of management and circumstances, showing equally varied degrees of success, but, as with everything else, the results depend upon the care, system, energy, and intelligence which are brought into the business as well as upon circumstances and conditions; and much depends, too, upon a wise adaptation of machinery and labor to the special requirements of individual cases. This paper will be confined almost entirely to facts, to practical experience, and official reports, drifting very little into theory or conjecture.

The earliest recorded attempt to apply steam power to the cultivation of land was stated by Mr. John C. Sutton, of Shirley, at a meeting of the English Farmers' Club, as published in the Farmers' Magazine, as follows:

> The first attempt appears to have been made as far back as 1618, was revived in 1634, and, at various periods since, attempts of more or less importance have been made up to 1854. We find in 1854 the late John Fowler exhibiting his steam draining plough at the Royal Society's meetings, and in the journal of that society is the remark, that surely this great power can be applied to more general purposes, and we commend the idea to engineers and mechanics; and the suggestion has not been overlooked, as subsequent successes amply prove.

As early as 1832 Messrs. Heathcote and Parker, of England, employed traction steam engines in clearing and cultivating a large tract of marshy ground, lying between Manchester and Liverpool, which had been considered unreclaimable by any other means then at hand.

It is computed that more than half a million dollars were expended in experiments for steam culture in England, up to 1858, before it became a practical success; and inventors in this country might not find it altogether useless to give careful study and attention to experiments and results in that country while pursuing efforts to perfect machines adapted to our wants.

From several reports of committees, published in the journal of the Royal Society of Agriculture in England, for 1867, are condensed the following statements relative to the results of steam cultivation in that country, the facts given suggesting many useful hints to farmers:

MR. REED'S REPORT.

The Royal Society designated three examining committees for three different sections of the country. Committee No. 1, consisting of three gentlemen, of which Howard Reed was chairman, was deputed to inquire and report the results of steam cultivation in the counties of Norfolk, Suffolk, Cambridgeshire, Huntingdonshire, Essex, Surry, Kent, Sussex, and Hampshire. They examined 36 farms on which steam power was used in cultivation, and completed their duties in 22 days in the month of September, 1867. Mr. Reed remarks, in the opening of the report, that the superiority depends not so much upon the power itself as upon the party that wields it. One successful steam farmer said to the committee that he had been over some steam cultivated farms without perceiving any decided advantage, and he had been over many others where he discovered as many advantages as he could show on his own place; hence, in some instances, steam cultivation is not a profitable investment, not from any defect of power or mechanical construction, but because parties do not take the advantage they might and should take in the management of it. Here, as elsewhere, success is obtained only when one combines with right business habits a fair knowledge of principles. And, Mr. Reed continues, this entirely concurs with our experience everywhere, in steam as in other farming.

Much difference of opinion was encountered as to the character of the soil; almost invariably it was represented as unusually heavy, and for this reason one question was often asked, "How many horses do you use in ploughing to a depth of 6 inches?" The answers, with our personal observations, enabled us to some extent to classify the farms according to the texture of the soils.

Mr. Allen, the owner of one farm examined, spoke very confidently of the increased bulk of his crops since the application of steam; but he experienced just those difficulties with which any one would expect to meet in attempting to cultivate a heavy-land farm not well drained—these hindrances being much increased in a rainy season. The work done by him, during the day of 10 hours, with steam plough or cultivator, was about 8 acres, ploughed 8 to 12 inches deep. After the harvesting of the hay crop, July 1, 323 acres were ploughed and cultivated, though not more than 20 acres could have been done without the steam power, and it was all well cleaned and in fine tilth for straw or root crops.

Another farm visited was Mr. Harvey's, with soil of such tenacity that three stout horses had enough to do in turning a furrow slice 7 or 8 inches deep. Mr. H. does not agree in the opinion of some of his neighbors as to the unprofitableness of thorough draining. During the first year of his experience with steam he met with every conceivable accident and hindrance, and the expenses for repairs were frightful; yet he stuck to the machine through all adverse circumstances, trained himself and his men to the use of it, and successfully outlived the jeers of those who are always ready to depreciate the efforts of men of progress. Breaks or delays are seldom or never known now; during a day of 10 hours 8 to 10 acres are ploughed to the most desirable depth; wheat stubble broken up 15 inches deep, and increased yield obtained. He has done contract ploughing for his neighbors 9 to 10 inches deep, at 12*s.* per acre. In August he ploughed in 17 days 113 acres, 10 to 12 inches deep, at a cost of only £26 10*s.* for the manual labor required in doing it.

Mr. Wallis, another steam farmer, in comparing horse-labor with that of steam, in case of deep work, says there is no doubt about the great advantage of the

latter. The Marquis of Tweedsdale's great plough, worked with 12 horses, got over about half an acre a day, but the seven-horse power engine did 3 acres a day to the same depth, with about 50 pounds of steam pressure. Mr. W. thinks that upon farms of 300 acres it will pay to have steam tackle. His experience shows that not only is the yield of wheat increased about 4 bushels to the acre, but its quality is improved and market value increased; the root crops and clover also are improved; the work is not only done with greater despatch, but with more certainty at the best possible time; once it was difficult to say when even four teams would finish a 20-acre field, on account of precarious weather, but now, with steam, the time of finishing a large field can be calculated within an hour.

Mr. Ruston has derived much advantage from steam culture, being able to turn up deep subsoil, with a plough made purposely for it, to the depth of 15 or 18 inches; he claimed largely increased yields, and greater breadth cultivated, since he employed steam; he says he obtained full one-fourth more an acre of barley and wheat; he also realized the advantage of despatch and seasonable work; steam had saved his crop more than once, and given him the benefit of having his seed put in properly as well as seasonably.

Mr. Smythe, at Newsellsbury, county of Herts, was visited in September. His farm consists of 700 acres arable land, and 50 acres of pasture; extending over an undulating surface, with many steep inclines, part loam, light soil, and stiff clay; part could be ploughed with two horses, and portions required three horses to plough 5 inches deep. Water was scarce, being brought three miles for the engine. He says steam enables him to get crops where before he had to fallow one season. By deepening his soil he gets increased crops and better quality, with greater breadth cropped.

After having gone over and completed the examination of this list of farms of various soils and locations, Mr. Reed proceeds to state at length the conclusions arrived at by the committee, which have been condensed as follows: Upon heavy and medium soils the benefits of steam cultivation are greater and more apparent. A deeper culture is effected than it is possible for horses to make, producing a highly beneficial change in the texture of the soil. It secures additional efficiency of drainage; augments the value of manures applied; brings into operation from below latent properties of fertility; fits the land for the growth of greater variety of crops; renders it more fit for pasture; and allows of a greater number of continuous crops.

Instances of these improvements and their advantages are not single or unfrequent, but general wherever tried. Another perceptible result is the rapidity with which farm-work is accomplished; not only are the operations done quicker, but better, and at less expense; all collateral movements have imparted to them a speed and a "whir" characteristic of steam; men acquire the prompt, active habit of doing the day's work within the day, and not leaving it for to-morrow.

Steam is thus working a revolution in farm practice, and in the character of the rural population, who are being trained for the age of machinery in agriculture; and with this celerity of motion will be coupled accuracy, promptness, reliableness, and certainty as to amount and time of accomplishment, which are no small advantages.

To the lighter lands it had been generally considered that steam was not adapted, and its progress hitherto in such districts has been comparatively small; for it seems to have been assumed, but somewhat hastily, that land ploughed easily by a team of horses is no place for steam; yet those light-land farmers who have fully tried steam, even with the apparatus adapted particularly to heavy lands, have formed a different opinion, as the deep culture which drains and relieves a wet soil in a rainy season also benefits a dry or burning soil in a dry season, by allowing needed moisture to rise from below, while what little falls on the surface is sooner absorbed and more fully retained. But heretofore steam has

been applied to light lands under disadvantages, and no one knows fairly what may be done on such lands until implements adapted expressly to them have been tested.

MR. CLARKE'S REPORT.

Committee No. 2, of which J. Algernon Clarke was chairman, was deputed by the Royal Society to report the results of steam tillage in the counties of Northumberland, York, Lincoln, Nottingham, Stafford, Salop, Flint, Montgomery, Worcester, Warwick, Gloucester, Somerset, Dorset, Wilts, Berks, Oxford, Bucks, Bedford, and Northampton.

The report of this committee embraces the experience of about 140 practical farmers who have used steam in cultivation upon an area of about 66,000 acres of arable land of various kinds, composed of farms differing in size from 200 to 2,500 acres, upon most of which steam has been thoroughly tried, with very general satisfaction and success.

Mr. Clarke remarks in the outset that it is high time to disabuse ourselves of the impression that steam tillage apparatus is novel, and therefore to be loaded with doubt and distrust; on the contrary, it has settled experience on its side, and is amenable to similar rules of calculation and esteem as other machinery, for steam ploughs have been in use long enough to give us trustworthy data of their usefulness. Mr. Clarke's report is divided between light and heavy lands; and he says, comparatively little really light soil was seen under steam cultivation by the committee; hence the report is not so complete upon the latter as upon heavier farms.

In 1858, when steam tillage was in favor only with men of advanced ideas and liberal foresight, Mr. J. F. Edwards, of "Taubolt farm," Northamptonshire, ventured upon the purchase of a set of the Woolston steam-tackle, consisting of a windlass, ropes, &c., with a three-tined and a five-tined cultivator, Fowler's three-furrow plough, and Hornsby's eight-horse portable engine, the cost of the whole being £500; and he found no difficulty in teaching his ordinary farm laborers to manage the apparatus successfully, the hands necessary to work it being three men and three lads, at an expense of only 10*s.* per day for the labor. Mr. Edwards's farm contains 300 acres of arable land, loam, on clay sub-soil. Before the employment of steam power he used three horses and ploughed 4 inches deep. Since the adoption of steam he has worked about 200 acres annually, ploughing 7 to 9 inches deep, at a cost of 8*s.* to 12*s.* per acre. His decided testimony was that the work is better done, the land warmer, dryer, more forward, and not so "starved," and the crops larger and finer. The greatest advantage is found to be on his strongest and heaviest land, the portions that had been badly drained being now the best; the texture of the soils is changed for the better, and the land ploughs much easier year after year. He said the only thing amiss with him is that he needs a ten-horse power engine, instead of the eight-horse machine.

Mr. Sowerby's farm, in Lincolnshire, embraces 650 acres of arable land, loam on clay, upon which ploughing to the depth of 4 or 5 inches is stiff work for a pair of horses; his fields 20 to 30 acres. Mr. S. expressed himself fully satisfied with the results. His ploughing costs 6*s.* to 8*s.* per acre, the cultivation somewhat less; but the great advantage is that the drainage is better, the land cleaned of weeds and thistles, the soil permanently improved, and, consequently, a decided increase of crops.

Mr. Dring, of Lincolnshire, at first used similar tackle to the above. He has worked several farms; lands, part of them strong alluvial, part flinty, with some marsh; surface level and uneven, some hilly; fields 6 to 26 acres. Later he worked with Smith & Chandler's ten-horse power; average day's work in small fields, 6½ acres; in large ones, 10 acres. Mr. Dring has not parted

with his horses, and yet is satisfied with the advantages of steam culture, as it always "brings him in time with his crops, both seeding and gathering."

Mr. W. J. Edmunds's place, in Gloucestershire, was found to be one of the best examples of completeness and expedition in steam tillage met with in the compass of the tour. He occupies about 1,000 acres arable and 200 grass land, in fields of 10 to 35 acres, tolerably level; soil, stone-brash, sandy loam, clay, and limestone; uses Fowler's 14-horse power and anchorage, long and short rope tackle, four-furrow plough and six-tine cultivator, with set of drags, &c.; whole cost, short of £1,000. Mr. Edmunds says the average cost of the tilled lands is about 4*s.* per acre for ploughing and 2*s.* for the cultivating and dragging. He finds the advantages to be improved drainage, cheaper tillage, seasonable performance of the operations, with more surface tilled and increased yields; his greatest benefits being obtained on stiff soil and with wheat and oats, as well as roots; the crops all being more equable, from the more even preparation of the ground and the more uniform seeding. He gets out of his engine the following large amount of work: on heavy, stiff lands it ploughs or digs 8 acres a day; on lighter, 10 acres (one acre per hour) a day. This is the average daily work, though the machine often ploughs 60 acres a week; the total cost, including interest, is 8*s.* 10*d.* per acre; of cultivation the engine does 18 acres, though varying from 15 to 25 acres per day, at a cost of 3*s.* 8*d.* to 4*s.* 6*d.* per acre. Finding plenty of work on his 1,000 acres for this machine, Mr. E. expressed the purpose of procuring another tackle to start steam cultivation on another farm, the first not being sufficient for two large farms.

Mr. John Walter, of Berkshire, employs steam tillage on his "Bearwood" farm, of 400 acres arable land, and 300 pasture. The land is tolerably level, in fields of 20 to 100 acres, being chiefly a reclaimed heath, of various soils, light and gravelly, and loam, with clay sub-soil. His course of husbandry embraces about one-fifth roots, balance grains. The chief benefits he finds from steam cultivation are: more thorough tillage, increased crops of turnips on stubble, tares, &c., which have increased his other crops. His tackle consisted of Clayton & Shuttleworth's ten-horse portable engine, with Howard's three-furrow plough, windlass, five-tined cultivator, and set of harrows, with ropes, &c., all costing £716; and the results of its performance have been entirely satisfactory, in view both of diminished expenses and augmented produce.

The Duke of Marlborough, Oxfordshire, has employed steam cultivation since 1861 on loam land, with sub-soil of rubble rock; a farm of about 760 arable acres, and 1,600 in grass and pasture, tolerably level, with fields of 30 to 40 acres. His apparatus consists of Howard's three-furrow plough, five-tined cultivator, windlass, ropes, &c., drawn by a ten-horse portable engine, which breaks up an average of 9 to 10 acres a day, at a cost of 4*s.* 3*d.* to 5*s.* per acre, producing improved texture of soil and increased yield. Experience of five years on some 5,000 acres, wherein this machine has done over 1,000 acres a year, has convinced the Duke and his agent, Mr. Napier, of the great utility and profit of steam cultivation.

Such are the committee's opinions and experience in regard to the results of steam tillage on medium and light lands; and Mr. Clarke further remarks:

> In many light land and other districts, now popularly supposed to be unadapted to steam tillage, we have not the least doubt that it only requires that the machinery be practically adapted to these particular kinds of land in order that it may be as completely successful as in other soils, and to win its way to success in all directions.

The following is a synopsis of Mr. Clarke's report, particularly on some of the farms denominated very heavy land farms.

Mr. F. W. Bignell, of Stony Stratford, farms 222 acres; the soil and subsoil are a heavy, tenacious clay; he has had several years' trial with steam tillage, and it has banished the bone fallow altogether, enabling turnips, mangolds,

&c., to be grown instead, and the fallow crops are clean and productive. With an eight-horse engine and three-tine cultivator, four to five acres are worked, and seven in long days, on fields of 20 to 30 acres. Among the chief beneficial results on this cold, stiff-clay farm is a much more effectual drainage, caused by the deeper stirring of the ground, with this stout steam ploughing, producing warmer and dryer soil; the old high backed-up furrows and lands are levelled, and still the water does not stand anywhere on the surface, as formerly, under the old horse-ploughing, even in a wet time; and altogether the advantage of steam culture has been very considerable.

Mr. William Lavender, of Bedford, has had eight years' experience with steam, under thorough, business-like management. He occupies 550 acres of arable land, strong clay and loam, on clay sub-soil, and always more or less wet, until the application of deep steam ploughing; and his decision is that all heavy lands should be well "steamed," and were he now without a steam plough and cultivator he certainly would buy one to-morrow; as to drainage, he says this deep ploughing makes decidedly the dryest ground, giving the largest yield.

The farm of Mr. James Bartlett, of Northamptonshire, was visited and examined, one chief object being to learn the practical working of the Woolston implements, and a peculiar form of windlass made by Edward Hayes, of Stony Stratford, the great advantage of which was said to be in the fact that relays of hands might be worked, while the steam horse never got weary, though never pulled up for rest during the 24 hours; it appearing that Hayes' method does for the stationary engine system what two engines do for the moving engine system, by abolishing the risky practice of signaling when both cannot be seen, whereby the work of ploughing can proceed in dark and foggy weather, by dusky twilight, or even by moonlight, with perfect safety to machinery and men. The rate of work on this farm is 5 to 6 acres a day with a three-tiner, and 8 acres with a five-tiner, the soil being stiff clay, taking four horses to plough six inches deep.

Mr. J. C. Robinson, of Bedford, occupies 400 acres arable land and 200 acres pasture; part of the surface is flat, some very hilly; soil, generally very heavy clay, with subsoil of gault or drift chalk-stone; fields, 5 to 42 acres. Mr. R.'s experience extends over a period of seven years. At first he worked a Smith's cultivator three years—then seeing that his neighbor Pike could "break up his land and form a good seed bed by going once over it," with Howard's cultivator, while he, with Smith's, "had to go twice over his land," he purchased Howard's implement. An eight-horse engine cost £255 and the apparatus cost £250, everything included, making a total of £505. The average land worked, 5 to 7 acres a day, and at a cost of about *5s. 9d.* per acre. He gets better crops, which he attributes mainly to more work being done in dry weather and early autumn. Mr. R. is in favor of deep ploughing and thorough drainage, which makes dryer, warmer land; and he says clay land should never be worked at all except when it is dry; for if moved when dry the air works deeper into and through it, making it more mellow, and promoting better growth.

In reading over the many reports, &c., from the scores of farms where steam trials have been carefully made, I find that the uniform testimony is to the same point, that deeper ploughing modifies the effect of drought, secures better drainage, affords longer time for working greater breadth and thus insures larger yields of all crops.

Mr. Thomas Revis, of Buckinghamshire, occupies 800 acres of arable land, of loam, gravel and clay, some very heavy and stiff, on clay and chalk subsoil; surface, mostly level; in fields of 20 to 60 acres. He uses a ten-horse engine, with Howard's tackle. His average work is 6 to 8 acres a day. He says the greatest advantage of this deep steam-tillage is the better drainage and improved texture of soil. He uses his steam apparatus more particularly after harvests, to cultivate 100 acres for wheat, and if for no other purpose he would

not be without it. The weather was so wet that he could not have put in his wheat but for the expeditious work of the steamer.

John W. Pell, of Thrapson, states that the great gain which he finds in the use of steam consists in a better drainage of the heavy staple, by "breaking up the hard-panny subsoil," and thus bringing a greatly increased root crop; while, also, the grain crops have been increased to the extent of 6 bushels to the acre above former production. Such handsome results having accrued it matters very little whether or not steam-tillage costs a few pounds more than the old horse-tillage, which it has displaced; though it is not certain at all that the cost is increased by steam over horses.

Owen Wallis, of Northampton, occupies a farm of 375 acres arable land and 28 pasture, with a large grazing farm at some distance away; and he has had five years' experience with steam cultivation. The largest portion of his farm is clay loam, on stiff clay subsoil, containing flints and pebbles; four fields of stiff clay; surface, gentle slopes, without steep hills. In 1861 Mr. Wallis bought a Fowler's fourteen-horse engine, with plough, cultivator, drag-harrow, ropes, reel, &c. With it from 300 to 400 acres have been grubbed or ploughed each year; altogether about 2,000 in five years; the daily performance averaging 6 acres with the digger or plough, and 12 acres with the cultivator, being done much more cheaply and much better than by any horse power. At the beginning of the fallow-break the cultivating was done 6 to 8 inches deep, whereas now the digger is put in 9 to 10 inches deep. By the use of steam Mr. W. gets five crops, where before he got only four, the fields then lying fallow once in five years; but now the deep ploughing, effected by steam, brings up new earth, which, mixing, renews the old soil, and obviates the necessity of fallow; and herein is another gain, getting an additional year's crop, as well as increased annual yield.

The operations of James W. Watts, in Northamptonshire, are extensive and varied, and present as fair a showing of the effects of steam tillage as any place examined; and the results are therefore given in fuller detail than in most cases. Mr. Watts occupies 570 acres arable land and 400 in grass, the soil, for the most part, being a strong poor clay, on a tenacious clay subsoil, with occasional patches of red land, of more productive quality; the surface is hilly with many steep slopes, even preventing one end of the headland being seen from the opposite headland, thus rendering sharp practice necessary with the steam-plough signals; fields, 30 to 65 acres. This tackle, purchased in October, 1861, consists of a fourteen-horse Fowler engine, anchorage, ropes, &c., with a four-furrow plough, seven-tine cultivator, &c., the whole costing £945. The cultivator is used more than the turn-over plough, the principal operation being to break up stubble grounds in autumn and cross them preparatory for green spring crops. On clean land the plough, with digging breasts on, is the best implement for this autumn work, to be followed by the cultivator crosswise in the spring. With steam at 80 pounds' pressure, using 10 to 11 cwt. coal per day, the work done is 5 to 6 acres ploughing, or 8 to 11 acres cultivating. Summing up all the expense, including wear and tear, interest, &c., the cost per acre is 7*s.* against 16*s.* for the same by horse power, though the former is better done than the latter. The permanent effects recognized on this farm are shown in the better drainage, dryer soil, broader surface sown, the high furrows or ridges levelled down, no water standing on the surface as before, even after the heaviest rains, the average rainfall being 26 inches; increase of yield, and a still greater gain even than augmented crops per acre, is found in the increase of acreage of crops grown—not only greater breadth of roots, but also of grains, because little or no fallow is allowed, deep and seasonable ploughing doing away the necessity of fallows, the usual four-course rotation system in this country being now changed to a five-course rotation, taking three straw crops together, instead of two with a fallow. The same general advantages are realized in this matter that are derived everywhere by prompt, thorough and seasonable operations in cultivation.

Lord Sudeley, of Cheltenham, first worked a Howard set of tackle with a ten-horse engine, in 1864–5; but this experience proving that more power was needed on his heavy, strong land, for very deep ploughing, a twelve-horse engine was procured. His tackle now consists of Howard's strong traction-engine, boiler placed transversely across the framing, carrying two winding drums, snatch-blocks, anchors, porters, &c., for the roundabout system, with 1,600 yards of wire rope, a five-tine cultivator, a three-furrow plough, and a traction wagon; the total cost being £968. His fields average 20 acres; the soil is very tenacious, with stiff blue clay sub-soil; the surface hilly, with some steep inclines. Under these conditions the steam plough turns over 3 to 4 acres, to the depth of 10 to 12 inches, daily, and the cultivator does 4 to 5 acres, including removals and stoppages. This farm has 100 acres arable land, and 160 acres pasture; hence the apparatus is let out for hire, having worked on ten different farms during the year. Mr. Colsey, the agent, says the drainage is more effectual; root crops are larger, and fed off to a better advantage; while a considerable larger breadth of crops are grown, under steam tillage, than before.

M. C. Randell, of Worcestershire, has had ten years' trial in the use of steam for cultivation of his lands, and his testimony is valuable and reliable. His farm consists of 430 acres of arable land, and 220 acres pasture; soil, for the most part, stiff blue clay, with a little sandy land; the surface uneven, with some steep places, and fields about 22 acres in size. He says the greatest advantage of steam culture consists in being able to take advantage of favorable weather for the work, and the more effectual drainage secured by the deep ploughing, Smith's grubber tearing up the clay even deeper than the tool is set. In one field, a little dishing, the water used to stand for 24 hours after a rain, but such has not been the case since the engine broke up the subsoil below the old staple. Mr. Randell thus sums up his views with regard to the three different implements which he has used:

> Without Fowler's three-furrow plough I should not have moved an acre an autumn, but with it we got over some 87 acres, and at less cost than it was done in years before. So I come to the conclusion there is good in all these implements. Smith's for real hard work, Howard's for crossing, and Fowler's for doing that which neither of the others can do as well. I have all three, and have tried them.

After going through the detailed results, discovered in examining the above, and many other farms named in his report, Mr. Clarke says, in conclusion:

> That wet as the weather has been for a long time, we found clay fields lying in splendid tilth for wheat seeding, with a broken-up staple soil nearly a foot deep, which is about twice the depth that it was worked under the former regime of the four-horse team ploughing; while more or less economy of tillage and increase of produce marks almost every instance noticed, the failures or doubtful results being easily explainable, so that the committee have arrived at this clear conviction and conclusion: Steam cultivation, in the main, answers the full expectation; and in cases where anybody has tried and given it up, we are sure, from the uniform success of so many men in different parts of the country, with every variety of soil and situation, that there must be an explanation of the facts—either the fault of the manager or defect of the particular machinery, not at all affecting the credit, or chargeable to the fault, of steam tillage. One fact is patent to all, that while some will follow the example of the successful steam-plowman, others will be warned off by the few who fail in its adoption, the brave imitating the success, but the timid the failures.

MR. COLEMAN'S REPORT.

The third inspection committee, Mr. John Coleman chairman, was deputed to report the results of steam cultivation in the counties of York, Durham, Cumberland, Westmoreland, Lancaster, Salop, Nottingham, Stafford, and Leicester.

The character of the farms, the manner of tillage, and implements used, and the results produced, as examined by this committee, were found to be substantially the same—varied in minor particulars by circumstances of location, capital, or intelligence of the operators—as those reported upon by Mr. Reed and Mr. Clarke, and the information obtained, with conclusions arrived at, by Mr.

Coleman, are essentially similar to those reported by the former named gentlemen, the uniform testimony being equally favorable for the employment of steam power in cultivation; all showing clearly to the reasonable mind that, under judicious, thorough management, great advantages are derived from the use of steam culture, in all localities and upon all varieties of farming lands. In concluding his report Mr. Coleman says:

In endeavoring to arrive at conclusions, we avoid instituting comparisons as to the merits of the different inventions. On this point readers will judge for themselves, but we will point out some of the conditions deemed most suitable for each. Where the farms are small, less than 300 acres arable, the lands hilly and fields irregular, we believe the roundabout system most practical and economical, whether the soil be light or heavy. In cases where the fields are large, level, and stiff, and the area greater, the direct traction offers advantages, in its greater available power for deeper work. On large areas of light land large results would be derived from the double engines. Our general conclusion is that success depends more upon management than upon the peculiar character of any particular apparatus; good management commanding success even under adverse conditions, while no advantageous circumstances can compensate for want of intelligent supervision. There must be patience and determination not to be overcome by difficulties which novelty and ignorance usually give rise to in new enterprises Granting then that the machinery is in good hands, and the conditions favorable generally, the result will be success—varying, of course, with the peculiar conditions of each case. This being so, we naturally inquire how it is that steam culture has made the comparatively little progress it has. Want of proper information is one cause, deficiency of capital is another, and a too natural distrust or want of confidence in great improvements and new things still another. Another point to be considered is the area upon which steam can be profitably employed. We have met some instances where profit and good results were obtained on a farm as small as 138 acres; but circumstances were very favorable, and the case too exceptional to allow of a safe or general conclusion to be drawn from it, but we believe that a farm of 250 arable acres about the minimum quantity on which profitably to introduce steam tillage instruments.

LATER TESTS OF STEAM CULTURE.

Results of practice in steam cultivation might be multiplied. Among other successful operators, a Mr. Smith, of Woolston, England, thus gives his experience with steam culture, and compares the cost of steam and horse power, in his own practice, as follows:

	£	s.	d.
No. 1, wheat, 1 smashing, cost 6s.; 2 scufflings, 4s., per acre	0	10	0
No. 2, beans, 1* smashing, cost 10s. 6d. per acre	0	10	6
No. 3, beans, 1* smashing, cost 10s. 6d. per acre	0	10	6
No. 4, wheat, 1 smashing, cost 6s.; 2 scufflings, 4s., per acre	0	10	0
Total for four years	2	1	0

Now calculate them under horse work:

	£	s.	d.
No. 1, wheat, 1 ploughing, cost 14s. per acre	0	14	0
No. 2, fallow, 3 ploughings, cost 38s.; 2 scufflings, 4s., per acre	2	2	0
No. 3, beans, 1 ploughing, cost 14s. per acre	0	14	0
No. 4, wheat after fallow	0	0	0
Total for four years	3	10	0

The operations by steam power, at a cost of £2 1s. per acre for four years, will work the land from 10 to 12 inches deep, and keep it clean forever. The operations by horse power at a cost of £3 10s. per acre for four years will work the land 5 inches deep, but they will not keep it clean. As to my produce under steam culture, the total produce of four years under horse culture was 85 bushels of wheat and beans, or of other corn of equivalent weight, per acre. The total produce of four years under steam cultivation is 140 bushels of wheat and beans per acre. Therefore the total increased produce is 55 bushels in four years, or an average of nearly 14 bushels per acre per year. I shall use some artificial manure to keep up this production. A fold was used under horse culture. This shows that steam power can beat horse power in depth, cost, and produce.

* Means a ridge ploughing and subsoiling at one operation.

At a recent meeting of the Royal Agricultural Society of England, at Leicester, trials of steam cultivating machinery were held in two classes—one for light land cultivation, and the other embracing machines for general purposes; the former being allowed six rounds each at 5 inches' depth, finishing the work at 6 inches; the latter making three rounds to open the work, four rounds at 6½ inches, four at 7 inches, and finishing at 9 inches. It is unnecessary to enumerate the entries, or to describe the work; but the following tabulation of results will be useful as data for examination of the capabilities of steam implements. The field was one with a very hard soil, covered with a growth of withered grassy reeds:

	Avery & Porter's stationary tackle.	Howard's stationary tackle	Tasker & Son's stationary tackle, with traction engine.	Fowler & Co.'s clip-drum tackle, with anchorage.	Hayes's stationary tackle.	Fowler & Co.'s single engine, with two winding drums and anchorage.
Price, English pounds	670	520	657	708	550	836
Power, horse	10	10	10	8	10	10
Number of hands, men	5	5	5	3	4	3
Number of hands, boys	2	2	2	2	2	2
Width ploughed, inches	40	40	32½	40	36	50
Time in setting down, hours and minutes	0. 48	1. 5	0. 44	0. 33	1. 48	0. 25
Time at work, hours and minutes	2. 48	2. 23	3. 31	1. 50	....	1. 20
Total time, hours and minutes	3. 36	3. 23	4. 15	2. 22½	....	1. 45
Area cultivated, square yards	6, 216	10, 626	9, 945	8, 924	....	6, 090
Weight of earth removed per square yard, lbs	427½	411	316	420	182	502
Area per hour, square yards	2, 220	4, 458	2, 826	4, 866	....	4, 566
Weight moved per hour, lbs	949, 050	1, 832, 040	893, 016	2, 043, 720	....	2, 292, 133
Weight moved pr. nominal horse power pr. h'r.	94, 905	183, 224	89, 302	255, 465	....	229, 213

The following figures, by Mr. Clare Sewall Read, a member of the British Parliament, favorably known as an English farmer, furnish additional data upon the comparative cost of steam cultivation under different circumstances:

		£	s.	d.
18	acres cultivated, at 6*s.* per acre, 7 inches deep	5	8	0
20	acres cultivated, at 7*s.* per acre, 8 inches deep	7	0	0
13	acres cultivated, at 8*s.* per acre, 9 inches deep	5	4	0
50	acres ploughed, at 7*s.* 8*d.* per acre, 8 inches deep	19	3	4
9½	acres ploughed, at 12*s.* per acre, 12 inches deep	5	14	0
9½	acres dug, at 9*s.* per acre, 9 inches deep	4	5	6
20¼	acres dug, at 12*s.* per acre, 12 inches deep	12	3	0
6½	acres dug, at 10*s.* per acre, 10½ inches deep	3	5	0
146¾		62	2	10

These operations in cultivation were performed at about an average of 10 acres per day, and at little more than an average expense per acre of 8*s.*, or $2.

The Farmers' Magazine for January, 1868, contains a somewhat lengthy report of a discussion had at a meeting of the "Central Farmers' Club" of England; subject, "The present aspect of steam cultivation." The chairman, in opening the meeting, observed that this was one of the most important subjects that engage the attention of agriculturists of the present age; and that three distinct reports upon it had been issued the past season by the Royal Agricultural Society, and no man had taken a deeper interest, or possessed more extended knowledge, or took broader views on that subject, than Mr. J. Algernon Clarke, who had made one of the reports, and whom he would now introduce to the club.

Mr. Clarke arose, and in giving some account of the travels and inspections of the committee, remarked that—

In speaking for the committee I may say that, in the course of several long rounds, extending from the fens below Petersburg to the apple country near Worcester, and from the chalk-downs near Wiltshire up to the potato country by the Frith of Forth, we met with plenty of hard work and amusing incidents.

Numerous opinions have been given on various points involved in the adoption of steam cultivation, and the main value of the reports consists in the multiplicity of examples, by means of which any person may see for himself what are the advantages of the several systems noticed, upon a farm similar to his own. The question is far too big and complicated to be settled off-hand, in a few hard-and-fast deductions; but I maintain that, taking the cases throughout the reports, you cannot draw any other conclusion than that the steam plough and steam cultivator are quite successful enough to warrant any man in adopting what he reads and sees is being done by other people. How many of the 135 farms and implements examined and described by the committees in their reports are evident failures? Are not nearly all the cases more or less successful? If you look through the document carefully you will find it bearing out my statements that only a very small percentage of the cases exhibit anything like failure, and that in nearly every instance the farmer is satisfied with the apparatus used, and that steam culture is beneficial to him.

Mr. Green, of Bury St. Edmunds, said that steam cultivation was a subject in which he took a deep interest. He had tried it, and believed it only needed to be practiced to be appreciated. He farmed about 400 acres of what was called light land, and was able to carry on his steam cultivation as easily as he had managed a pair of horses. He was prepared to state to the club the cost of this cultivation. He had an engine of full twelve-horse power, with double cylinder, costing £200; other machinery and implements, £538; total, £738; with which he cultivated, generally, from 10 to 16 acres per day, at an average cost of 4*s.* 11*d.* per acre; he, therefore, knew that steam cultivation was both practicable and profitable.

The discussion was continued for hours by a score or more of earnest, intelligent and experienced gentlemen, with much interest and animation; the whole eliciting facts similar to those quoted, and confirming the facts as to the practicability of steam farming.

In the February number of the same magazine appears an account of an interesting discussion that was had upon this subject at a meeting of the Batley and South Hants Club, in which facts and results were stated which entirely corroborate the statements in regard to the advantages of steam culture presented in the preceding reports.

Such is a fair and faithful history of the introduction and results of steam ultivation in different portions of England.

STEAM TILLAGE IN FRANCE.

In the summer of 1864, Monsieur F. Geuyrand wrote to Messrs. Howard rela tive to the performance of their steam cultivating implements, as follows:

It gives me pleasure to assure you that I am perfectly satisfied with the steam cultivating apparatus you sent me last year. By means of it I have been able to break up, 19 inches deep, land on a subsoil almost as hard as a rock; the deep tines made for this work stand the severe test well and make complete work. The cost of thus breaking up the land by steam power has been about £4 16*s.* per acre; while before, the same (not possible to be done by horses) cost in manual labor at least £24 per acre. I look for results still more advantageous.

The following facts are gathered from the Farmers' (England) Magazine, for November, 1867, from a report on experiment with steam power for cultivation, made at Petit Bourg, near Paris, in the autumn of that year. After detailing many difficulties and the opposition with which M. Lecouteur had to contend, the report goes on to say:

From the commencement of his efforts, he had succeeded in obtaining the Messrs. Howard's promise to support him with a trial. It was announced that they would work the various combinations of their system, and the same contrivance exhibited by them at Bourg, known as the "twin system," which consists of two engines and implements working at the

same time, thereby doubling the amount of work done. Also, after some hesitation, Messrs. Fowler & Co. promised to be present with their apparatus at Petit Bourg, in which neighborhood their hands and tackle had been at work for several days ploughing the lands of the neighbors at 8*s*. per acre, just to keep them occupied until the great trial days, and consequently had the advantage of being practically all ready for trial work at the first signal from the judges, while Messrs. Howard had to send a second set of their tackle purposely from England in order to work the "twin system," about which so much curiosity existed among the French agriculturists. The day of trial dawned bright and genial; the people, by hundreds, flocked to the field; almost every nation in Europe was represented. But, alas! no second tackle of Howard's arrived from England, on account of the stupid neglect to ship it; and so the "roundabout" tackle, as compared with Fowler's double-engine work, seemed slowly and painfully to toil round the piece marked out for work. Of course, under these circumstances, any fair comparison of the two systems was out of the question, and the judges suspended any decision for the present. But Fowler's engines tugged at the various implements—the plough, the cultivator, and the harrow—with satisfactory and astounding effect, commanding the admiration of all. We may say, never was such a triumph acknowledged for steam culture in one day before; it was a proud, hopeful day for French agriculturists; and M. Lecouteur, with his friends, were greatly elated by their victory. All felt that the 19th and 20th days of September, 1867, must rank among the important dates in French history.

Since then the French government has knighted the plough, as among heroes of honor, with the royal "Medaille Agricole."

And here let me pause a moment and ask, shall steam cultivation speedily become as successful in the United States as it has in Europe? We have as much active and energetic enterprise, we have as favorable lands for it, and we have as ingenious mechanics and inventors, who have as nobly succeeded in other matters of great improvement and progress.

STEAM PLOUGHING IN THE UNITED STATES.

With the mass of incontestable proofs before us of the profit, utility, and large employment of steam cultivation in Europe, it is surprising that it has not been more widely adopted in this country. Certainly this region, for several reasons, is the most favorable for its application. Our working, or dry seasons, are longer, we have larger territory of arable lands and broader surface of level fields, with greater scarcity of manual labor and fewer working animals, hence are subjected to higher prices for labor. Our people are notedly progressive in all other matters, and steam culture will, *must*, become successful here. It is a necessity, and steam will yet be applied generally in our agricultural operations. The experiments, with partial failures, of Fawkes have not lessened my confidence.

In 1855 Obed Hussey, of Baltimore, invented and put into operation a steam plough, which performed to some extent, but not satisfactorily; but sufficiently succeeded to lead him to believe that, with some alterations, it might become a practical success; he therefore made some changes, and in October, 1856, he made another trial with his machine at the Indiana State fair, Indianapolis, for which he received the society's premium of a silver cup. It cut six furrows across the field, seven inches deep, through heavy sod, doing the work reasonably well, yet the machine proved to be imperfect. Since that time I have heard nothing of Mr. Hussey's undertaking with steam, though he has been the inventor of other useful farming implements.

Even earlier than this, Mr. Bronson Murray, of Illinois, had suggested, and confidently predicted, that steam ploughing must, and soon would, become general in the great prairies, to follow, as a necessity, the important success of harvesting and mowing machines, with seed drills, already largely in use on the farms in that region; and every thinking man felt that some more tireless power for ploughing than animal muscles was an essential desideratum in this almost boundless region of arable land; and in this spirit the Illinois State Agricultural Society, in the winter of 1858, offered a premium of $5,000 to be awarded to the producer of the best steam ploughing apparatus that should be exhibited for trial at their next State fair, to be held at Centralia in the following September.

Under this inducement Mr. J. W. Fawkes, of Lancaster, Pennsylvania, entered the apparatus of his invention and manufacture, being a traction engine, drawing six or more ploughs, so attached on beams to the rear of the locomotive that they could be at pleasure quickly raised from the ground by chains running over pulleys, all by the steam power, when not desiring to cut furrows while moving.

The writer of this article was on the ground at the first trial, in September, 1858, and saw the first furrow turned by this remarkable machine, and never will he forget the pride and pleasure he experienced, the high hopes excited, and the admiration and respect he felt for Fawkes from the performance of this machine, with the vast benefits which he confidently anticipated would occur to agriculture generally by its employment, but especially to the broad, limitless prairies then before him.

More recently, May 10, 1868, Mr. P. H. Standish, of Martinez, California, has patented a new steam-ploughing apparatus, which is quite novel, and for which its friends claim much merit, though, of course, it has not yet passed the ordeal of extended practical test, and must have time and experiment to prove whether it may be a success or not. It is propelled by an ordinary steam engine, placed upon a form or frame-work stationed on wheels to carry and guide it, while the digging apparatus is geared directly to the engine by crank, drum, and pinions, so that less power is required to work the machine. The peculiar feature of this apparatus consists in the manner of cutting or breaking the ground; it is not done by shares turning furrows, nor by spades lifting and dumping the earth, but by four knives or spits, set at right angles vertically in a head-block of cross bars, revolving horizontally on a perpendicular shaft, tearing and stirring the earth in a transverse direction to the movement of the machine, something in the manner of a revolving harrow. Two, three, or more of these implements are worked, and follow the engine, according to its power and as may be desired.

Certainly this mode of stirring and pulverizing the soil is much better than simply turning it over with the ploughshare; the plough, by the pressure or friction in running, has the effect, more or less, to pack and harden the subsoil or bottom of the furrow, on which account spading leaves the ground in the best condition. But it is a question whether this machine will work well in sod or turf, or original breaking up.

In addition to the efforts and inventions of our countrymen from time to time for supplying this great want by adapting steam-power to the profitable and pleasant cultivation of our lands, several Europeans have, at different times, introduced their tackle into this country, with little success. I shall be proud to see our own people succeed and take the palm, yet let us have success, even though it may come from across the water.

CONCLUSION:

I cannot too earnestly impress upon the minds of those interested—the farmer needing the implements and the mechanics to invent and make them—the vast importance of the subject of steam cultivation. In no country is it so much needed as in ours; nor is any other so largely and happily adapted to its employment. The surface of our lands and the texture of the soils are decidedly favorable, particularly the broad prairies, and the older cultivated farms of New York, Pennsylvania, and New Jersey; the flats of the Genesee, the Mohawk, the Connecticut, and of some other rivers, are all waiting for the steam plough.

One of the greatest benefits to result from the employment of steam in the cultivation of our lands, and that which constitutes its most charming feature, is, that in order to realize its fullest and highest advantages, lands and implements, must be kept in the very best condition, all the operations must be per-

formed in the most skilful manner, and the whole business of the farm conducted with systematic arrangement; thus inciting habits of thought, care, and order, which in the end render all business more successful, profitable, and attractive. System not only promotes efficiency and promptness, but it also prevents annoyances and avoids disappointments. Thus mental elevation as well as pecuniary gain, and by both increased happiness, is sure to be secured by the introduction of improved powers and machines into our agricultural business.

Perhaps the chief reasons why steam ploughing has not succeeded in this country, and become generally employed and popular, as in Europe, are the want of more general information on the subject, and the lack of capital among farmers for ready outlay for expensive implements.

Were agriculturists more fully informed in regard to the capacity of steam power for this purpose, and better acquainted with the results, where it has been thoroughly used and proved, it would be generally adopted in the country. Those having the needed capital would purchase; and where individuals lacked means several would club together and purchase; or, as is the case now, with break-up teams and threshers, some one having the capital would procure and fit out a complete steam-ploughing tackle for ploughing, cultivating, and harrowing, and do the work for a township or neighborhood, a practice frequently adopted even in England.

In some portions of our country, as on the large prairies, it has been urged as a special hindrance to the introduction of steam-power on the farms, that there is a lack of water and fuel, which are to be obtained only at an expense that will not warrant their consumption by the steam engine; but the uniform testimony of those who have made the trial, is that the expense, at highest figures, of feeding the engine is far less than that of feeding animals enough to do very much less work in an inferior manner. Besides, the difficulty referred to may to a great extent be avoided by the use of Ericsson's caloric or hot-air engines, which require no water and very little fuel, while there is no liability to explosions, and much less danger from fire than with the ordinary steam engines.

The principal and positive advantages derived from the use of steam in ploughing, as shown by the foregoing pages, may in brief be summed up as follows:

It will plough and cultivate deeply, cheaply, and rapidly, leaving a deeper, mellower, and warmer soil.

Its rapidity of execution enables the farmer to cultivate a larger area at exactly the time to secure the best product.

It excites greater activity and promptitude among farmers in other matters, and leads to habits of system and order in all their operations.

It substitutes artificial or machine-power, always attainable to any extent, for animal power and manual labor, which are often unattainable to the needed extent.

It secures uniform seeding and ripening of crops, for the same engine can at the time of ploughing also sow and harrow the ground by having power enough to draw all the implements at once.

With the stationary engine some spots and marshes can be drained and ploughed, and rendered highly fertile, which cannot possibly be done with horses, for want of power, and footing on which to walk; and hence, inaccessible lands, almost useless, can be reclaimed and become the most productive, as has been repeatedly done in the Old World.

Thus, in this mode of cultivation we find pleasure united with profit, ease with enhancement, new lands are added to old fields, the dormant earth below is brought to mix with and revive the exhausted soil above, and all improved; and in all this process the mind, as well as the purse, is filled and benefited.

Finally, deep ploughing or spading of land, by which a warm, dry, mellow soil is produced, is the true acme, the real charm and test of good farming; and is not second even to a wise adaptation of seeds to soils. A tree or plant can no

more live and thrive with its feet in the wet and cold than a man can. Deep ploughing and thorough drainage allow the air more completely to permeate all parts of the soil, which aids greatly in warming and pulverizing the ground, and stimulates a healthy growth of the plant, both in its early germination, and in its successive progress and fruitage. The beautiful and healthful operation of producing a kindly, fertile soil, as all intelligent testimony assures us, can in no other way be so surely and economically accomplished as by the employment of steam cultivation.

STEAM PLOUGHING IN LOUISIANA.

By H. E. Lawrence, Louisiana.

From time immemorial, or at least from the period when Elisha of old was summoned from behind his primitive plough, and his team of 12 yoke of oxen, to assume the functions of prophet and teacher for the Hebrew people, until within the last few years, no practical efforts have been successfully made to supersede the old ox and horse system of cultivation by steam ploughing machinery. When we consider that but a few years have elapsed since steam cultivation was only an idea; that the inventors had no previous models or similar appliances to work from, but had first to discover the principles and then apply them in all their details to the invention of proper machinery, the present developed condition of the steam plough is truly wonderful.

How well the English manufacturers and inventors have succeeded in introducing and perfecting the steam plough, their statistics show. In 1860 there were over 500 sets of steam ploughing machinery working for the farmers, but how many are at present in use I have no positive means of knowing, and can only say that the manufacturers' No. of sets of steam ploughing machinery imported into Louisiana in December, 1867, and now working on Magnolia plantation, is 918, showing that nearly 1,000 sets of steam plowing machines have been manufactured by the house of John Fowler & Co. alone.

The English farmers have outstripped our people in the successful use of the steam plough for breaking up and cultivating their farm lands. The rough stony counties of many of the chalk and stiff clay lands, where the undulations are from 30 to 50 feet, are now cultivated by the steam plough. The old Viceroy of Egypt, a Bedouin Arab, a man of great sagacity and enterprise, imported, several years since, over 200 sets of the most approved steam ploughing machinery, with which he breaks up and ploughs more than 300,000 acres yearly of the lands upon the river Nile, and plants them in cotton, rice, and sugar cane.

All market gardeners and the best practical farmers and cultivators agree that deep trenching or spade husbandry produces a much larger yield of crops of all kinds than any other known system, the chief advantage being in a thorough breaking up, loosening, and perfect admixture of the soil. This most desirable object can be accomplished much better and more cheaply by the steam plough than by the spade or by any other known implement. All English farmers familiar with the use of the steam plough agree that the surface water will not stand upon lands broken up by this plough. On the sandy lands near Cheltenham, England, the market gardeners, to prevent their crops from suffering from drought, spade the ground from 20 to 30 inches deep. By this means the lands, which would be dried up in hot seasons, are not affected injuriously by dry weather—a fact worth knowing to the market gardeners in New Jersey and elsewhere.

The majority of the lands in the United States, if put under steam plough

cultivation, and kept free from the treading and kneading of the soil by the horses' feet, would only require one deep breaking up and ploughing every fifth year, and would then be left in identically the same condition as if dug up with a spade.

There have been but two sets of first-class steam ploughing machinery imported into the United States. One is at work near Decatur, on the great prairies of Illinois; the other is in Louisiana, at work on the Magnolia sugar plantation, about 40 miles below New Orleans. They are of the same size, power, and dimensions, as follows: two 14-horse power, double cylinder traction (or locomotive) engines, each having self-moving and reversing gear, water tanks, steerage, with road wheels 22 inches wide, winding drum, and patent, self-acting cooling gear, spuds, tools and tool boxes complete, and ready for cultivating the soil. There are also included 800 yards of steel wire rope, one six-furrow balance-wheeled plough, one seven-tine pulverizer or sub-soiler, balanced and on wheels.

The entire machinery complete cost in England £1,500. Each of the locomotives or traction engines weighs 10 tons, without coal or water. The engines are driven to the roads or head lands, where they stand on opposite sides of the field, and haul those great balance-wheeled cultivators or ploughs back and forth at a speed of over four miles an hour; or faster than a man can walk.

The engines, ploughs, and the entire steam ploughing machinery are worked and managed with the greatest ease and facility, going over bridges and ditches, moving and turning as easily and speedily as a six-horse team.

The old "plantation hands" very soon learn how to run the machines, and, after a few weeks, are trusted with the entire management, being divided and placed as follows: one man to each engine, who keeps his machine in order, does his own firing, greasing, &c.; two go with the steam plough, one to steer and one to aid in case of stumps or obstructions, and one boy, with a cart and team of three mules, hauls the coals and water for both engines. Each engine consumes seven barrels of coal for a day of 10 hours. The coal costs in Louisiana, delivered on the land alongside of the levee, 65 cents per barrel.

The usual task in England of a set of first-class steam ploughing machinery is eight acres per day of 10 hours. The sub-soiler or pulverizer will work over from 12 to 15 acres per day, breaking, stirring, and tearing it up from 15 to 18 inches deep. The cost of ploughing in Louisiana, running 14 inches deep through the toughest and most sticky soil ever seen by man, is about as follows, allowing for a sinking fund and interest upon first cost, about 20 per cent. per year for both items:

Labor of four men and one boy, per day	$5 00
Fourteen barrels of coal, at 65 cents	9 10
Use of water, cart, and three-mule team	2 50
Oil, cotton waste, and gum packing	1 40
Current expenses per day	18 00
Add 10 per cent. per year on the first cost, say $11,000, greenbacks, for wear and tear per day	5 00
Ten per cent. for interest on cost	5 00
	28 00

This allowance is much too large; making the cost for each acre of land broken up and ploughed 14 inches deep, $3 50, not a very high price for such ploughing.

The census returns for 1860 show the money value of the products of the whole people of Massachusetts to be $243 per head for each man, woman, and child; while in the State of South Carolina, by the same returns, the money

value of the labor of the whole population is $56 per head. And why and what is the cause of this astounding difference? The answer is simply that Massachu setts runs her machines by the aid of skilled labor and steam engines; South Carolina runs her machines by horse power and unskilled manual labor. What say you, farmers and grain raisers, east and west, will you give a good reason why your grain and wheat crops fall short, year after year, until your yield does not average one-half of former years? Would not steam ploughing machinery, that would tear up, pulverize, deep-trench, and plough your lands, turning up a new virgin soil in the place of your old, worn-out fields and farms, make you feel as though big grain crops were again within your grasp?

The first cost of steam ploughing machinery is of very little importance, provided the quantity of work it is capable of performing is in accordance with the outlay. The most important consideration of all is to economize manual labor, which is daily becoming scarcer and more difficult to procure. The steam plough of the first class, as above described, with proper management, will do as much work daily as 30 horses. In prairie lands, where there are no stumps, stones, or obstructions, it will be readily perceived that a steam engine, propelling four or six ploughs, eight or ten inches deep, at a rate of four miles per hour, can easily break up 15 or 20 acres daily, or in 10 working hours.

In England very many of the steam ploughing machines are owned and worked by stock companies; and they travel over the rough and hilly agricultural counties in England, and plough and break up the farm lands for the farmer for hire, charging from *5s.* to *15s.* per acre for the work, on precisely the same principle as the great threshing machines in the west travel from farm to farm and from county to county, through the working season. The first-class steam plough will average, one year with another, 1,500 acres of land per season.

CLIMATE OF THE PACIFIC COAST.

By Prof. E. C. Merrick, Washington, D. C.

From the analogies of continental position, the climates of our Pacific coast are, in fundamental character, closely assimilated to those of the western coast of the eastern continent. Among the more striking points of resemblance may be noted the abrupt northern deflection of the isothermal curves. A single example from Blodgett's charts will sufficiently illustrate this point.

The annual isotherm of 50° Fahrenheit passing through London, England, latitude 51° 30′ north, is depressed southward more than 10° in crossing the Atlantic, striking the American coast near New York city, latitude 40° 42′ north. The northern deflection of this isotherm on the European coast is obviously the result of the system of warm-water currents springing from the Gulf Stream. These currents bear the heated waters of the tropical seas diagonally across the Atlantic, ameliorating the rugged northern coast climates of Europe, and placing them upon a par with opposite American coast climates, at least 10 degrees further south.

The same isotherm of 50° Fahrenheit passes nearly west across the American continent to longitude 103° west, where the elevation of the Rocky mountain plateau causes it to dip suddenly southward as far as the latitude of Santa Fé; thence crossing the Rocky mountains westwardly it trends northwest, almost parallel with the Pacific coast, to the north end of Vancouver's island, latitude 51° 30′ north, about the same northing as upon the European coast. Mr. Blodgett's later examination of the meterological observations made in Alaska by the Rus-

sian government during a series of years, presents remarkable confirmations of this northward tendency of the isotherms on our western coast. The annual isotherm of 40° Fahrenheit, coasting northward through the southern part of Alaska, curves westwardly across the peninsula to the northward of the Aleutian islands, and bends rapidly southward on approaching the Asiatic coast.

Maury, in his "Physical Geography of the Sea," indicated the cause of this isothermal elevation in a system of warm-water currents, similar to the Atlantic Gulf Stream, and its branches. Only the rudimentary points of the Pacific system of currents were then known; but Maury's theory has since been amply verified by later and very careful observation. Captain Kerhallet, of the French imperial navy, in his "General Examination of the Pacific Ocean," has clearly traced the analogue of the Atlantic Gulf Stream in the "Japan current" of navigators, called by the Japanese themselves "Kuro Siwo," or black stream, from its dark color, in which, as well as in other remarkable points, it strongly resembles its Atlantic congener.

This Japanese current, or Kuro Siwo, results from two currents of heated water from the Indian ocean, one passing through the straits of Malacca and the China sea, and the other skirting the eastern coast of the Philippine islands, at the northern extremity of which they unite opposite the Japan islands; this united current again divides its main branch, trending east-northeast, strikes our Pacific coast about midway between Vancouver's island and Sitka island. The waters of the current near its southern edge, latitude 21° 20′ north, longitude 163° 20′ west, were found by M. De Tessau, commander of the French frigate Venus, to be 4° 30′ Fahrenheit hotter than those just outside the current; a difference which would have been much greater if the observation had been made with water from the main axial line of the current.

On the 24th of January, 1856, Lieutenant Silas Bent, United States navy, read before the American Geographical and Statistical Society of New York a very learned and able memoir upon the Kuro Siwo, from which the following passages are taken:

> The softening influence of the Kuro Siwo is felt on the coasts of Oregon and California, but in a less degree, perhaps, than that of the Gulf Stream on the coasts of Europe, owing to the greater width of the Pacific; still the winters are so mild in Puget sound, latitude 48° north, that snow rarely falls there, and the inhabitants are never able to fill their ice houses for the summer; and vessels trading at Petropaulovski, and the coast of Kamschatka, when becoming unwieldly from the accumulation of ice on their hulls and rigging, run over to a higher latitude on the American coast, and thaw out in the same manner as vessels frozen up on our (Atlantic) coast retreat to the Gulf Stream until favored by an easterly wind.

The impact of the Kuro Siwo upon our western coast is more feeble, on account of the greater mass of intervening ocean water, than the impact of the Atlantic Gulf Stream upon the European coast, and consequently it is less potential in directly elevating temperatures. But any deficiency resulting from this cause is amply compensated by the narrowness of Behring's strait, through which a much smaller volume of floating ice and cold Arctic waters is discharged than those immense masses of both which sweep down into the Atlantic, rapidly absorbing the heat brought up by the Gulf Stream. The projecting peninsula of Alaska, with its out-lying islands, also deflects far to the westward the reactionary arctic currents, and protects our western climates from their depressing influence. The southeast winds, laden with moisture from the tropical atmosphere of the ocean, prevail along the coast during the winter or rainy season. Their latent heat, set free by precipitation, combines with general influence of the Kuro Siwo in elevating the temperature and bending northward the isothermals. These facts are sufficient to show why Puget sound is on a par with New York city, while British Columbia and the southern part of Alaska are found within the same climatic parallels as northern New York and New England.

There are, however, some very remarkable and important minor variations from the coast climates of Europe, in those of our Pacific coast. These are

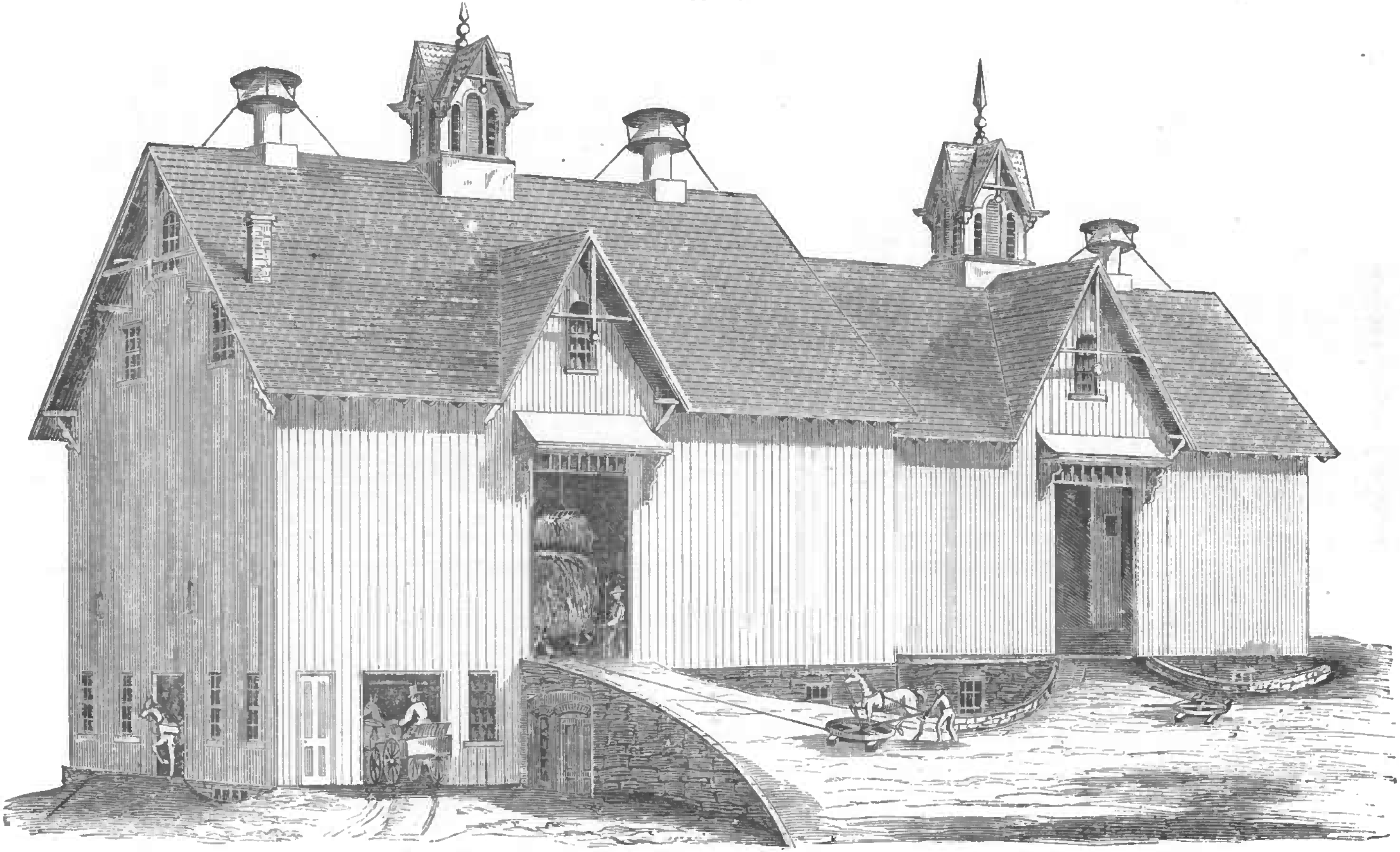
especially appreciable in the sensible climate, and in all its practical relations. First, there is found along the Pacific coast an unexpected lowering of the normal curve of temperature through successive hours of the day, and through successive months of the year. In other words, the theoretic temperature, which should have resulted from known conditions, is modified and depressed by causes hitherto unsuspected, but now matter of both common and scientific observation. Among the cases of this hitherto departure from the theoretic standard is found the peculiar play of the oceanic currents. In its passage through the immense volume of the Pacific ocean the Kuro Siwo has parted with its surplus heat, and has also incorporated some of the cold waters of the reactionary arctic currents; while it has raised the general temperature of both air and sea it has become a current of comparatively cold water itself. On reaching our coast it divides itself into two branches, one of which flows along the coasts of Oregon and California, sensibly depressing the local climates of the coast. This depressing influence is particularly appreciable in such localities as San Francisco and Monterey, producing a degree of cold in midsummer which is felt as a harsh, abrupt and unnatural displacement of normal conditions. It is reinforced by the cool northwest winds prevailing from June to November. The scope of this reactive tendency, however, is limited to the local climates of the coast.

Another and very important difference between the climates of our Pacific coast and those of Europe is found in the comparatively narrow range of barometric and thermometric oscillation. These are but the scientific expression of those conditions of majestic equability which first suggested the name Pacific, a name the significance and appropriateness of which become more striking as our knowledge of it increases. For this very remarkable exception from extremes of variations our western coast is indebted to the great width of the Pacific ocean. The hurricanes generated in that mighty cauldron of atmospheric forces the Gulf Stream, are hurled across the narrower volume of the Atlantic with a force sufficient to be severely felt upon the coast of Europe. Storms entirely analogous, and accompanied by electric and calorific changes equally marked, prevail upon the Asiatic coast, and have been traced some distance along the Kuro Siwo; but the mighty mass of the Pacific waters calmly absorbs their fury, and prevents their disturbing force from reaching our shores. The atmospheric changes of the Pacific coast are consequently more uniform and of minor range. Comparing the averages of winter and summer temperature along the isothermal line of 50° Fahrenheit, the variations on the Atlantic coast are found to be double those on the Pacific. As a specimen of extreme variation a little further south, it may be stated that the mean range of winter temperature at San Francisco from the mean of July is only 8° 30′ Fahrenheit, whereas the variation at Washington, D. C., is 44° 30′ Fahrenheit, or more than five times as great.

This absence of disturbing meteorological forces, as indicated by this narrow range of barometric and of thermometric oscillations, is sufficient to account for that freedom from explosive electricity which enables the climate of California to meet so accurately the delicate requirements of the silk culture. The deficiency of electrical excitement, and especially the absence of atmospheric concussion, with other favorable conditions, secure the practicability of four crops of silk-worms during the growing season; a fact the influence of which upon the productive industry of the country is beyond all present estimate.

A still more prominent point of difference between our Pacific climates and those of Europe is found in the periodicity of rain. The arrangement of the year into two seasons, wet and dry, instead of four, is found only in the lower latitudes of Europe and Africa. On the Pacific coast it is observable, north of the Columbia river, as far as the 48th parallel. Nearly all the rain of California falls between November and June. According to Blodgett's hyetal charts, the annual fall of rain in that State is about 22 inches, decreasing southward to the Colorado desert, where it amounts to almost nothing. In the northern

FIG. 1



DAVID LYMAN'S BARN. (Northwest View.)

PLATE XXXIV

part of the State, and on the western slope of the Sierra Nevada, the range is stated at 35 inches per annum. The general average is about half that of the States east of the Mississippi. This average increases northward. At Humboldt it is about 45 inches, and at Vancouver's island about 65 inches per annum. At Port Townshend, on Puget sound, the distinction between the wet and the dry season is practically obliterated, the fall of rain being distributed throughout the year. On Sitka island it becomes excessive, the mean annual deposit being 89.90 inches.

This feature of the Pacific climate finds its explanation partly in the peculiar chorography of the country. The Sierra Nevada, exceeding in altitude the Rocky mountains, stands like a wall from 6,000 to 8,000 feet high, practically bisecting the lower and rain-bearing strata of the atmosphere. This renders the climate of the western slope essentially an insular one, or, at least, modified to a very limited extent by continental influences. The periodic ocean winds practically control precipitation. During the winter or rainy seasons these are from the southwest, south, or southeast, blowing from the saturated atmosphere of the intertropical ocean; they not only assist in raising the winter temperature, but also supply the copious moisture precipitated during the rainy season. During the dry season the prevailing ocean winds are from the northwest. Even if these should become saturated in blowing over the colder waters of the north Pacific, they could not condense into rain-clouds in passing over the land, the excessive radiation of the summer parched surface elevating their temperature above the point not only of precipitation, but also of condensation. But this absorption of surplus surface heat also lowers the summer temperature and combines with other influences in limiting the thermometric range before alluded to.

These general controlling elements combining with the unique chorographic features of the country, give rise to a matchless versatility of local climates. These acting upon a soil of exquisite fertility, yield, in answer to intelligent agriculture, a variety, luxuriance, and delicacy of production, esculent, cereal, fibrous, and fruital, unparalleled on the face of the earth. The salubrity of these climates, with a few local exceptions, is unsurpassed. Their freedom from injurious variation was a matter of common report long before it was verified by scientific observation. The climate of California has been described by the most trustworthy observers as genial and invigorating. The most active outdoor labors may be performed at all seasons of the year, and at all hours of the day, even in the most sultry valleys. This results from the dryness of the atmosphere, which prevents the few hot days from being at all enervating. Such a thing as a hard winter, as understood east of the Mississippi, is unknown even as far north as Washington Territory. All reports, both common and scientific, seem to coincide in the statement that the Pacific coast presents the most desirable conditions of climatic influences upon earth.

MODEL FARM BUILDINGS.

We of the latter half of the 19th century live in better houses than our fathers had; we surround ourselves with more luxuries; we work harder, those of us who do work, and we probably take more real comfort. We were bred to think that a farmer's barn should be bigger and better than his house, and when we saw fine large barns and out-buildings, well kept and neat in their surroundings, we were quite of a mind to excuse a lack of taste and order about the dwelling. For many years there have been those who mourned over the evidence of effeminate ease and luxury which has evinced itself in more commodious and con-

venient farm-houses, especially noticeable in the older and more thriving States. This only shows that farmers with tolerable out-buildings provide the comforts of modern civilization for their families before they rebuild their barns. Never theless, we attribute many of the new barns to the old feeling that the house of a good farmer must not eclipse his barn. However this may be, large and excellent barns have greatly multiplied of late, and many of them are planned and built upon principles of sound science and the most rigid business economy. Such an one is here presented and explained by prospective elevations and diagrams.

David Lyman, of Middlefield, Connecticut, is a man of enlarged views. Born and bred a farmer, he lives upon the same farm his ancestors have occupied for the last four generations. He has given employment to the water-power of an adjacent stream, and, as farmer, manufacturer and merchant, applies the principles of thrift most rigidly to every branch of his business. The result is, if he invests money in any business venture, it is with the expectation of its returning good interest, simply in a pecuniary point of view. The barn of which we write is an investment of this character, and, however much convenience has been consulted, simple and rigid economy has never been sacrificed.

One is struck at first sight with the substantial character of the structure, and the more thorough the scrutiny the more will this be seen. From pinnacle to foundation, nothing has been slighted; all the work has been well done; the timber is sound, the framing correct, braced, bolted, and counter-braced; and the same thoroughness is exhibited in every part.

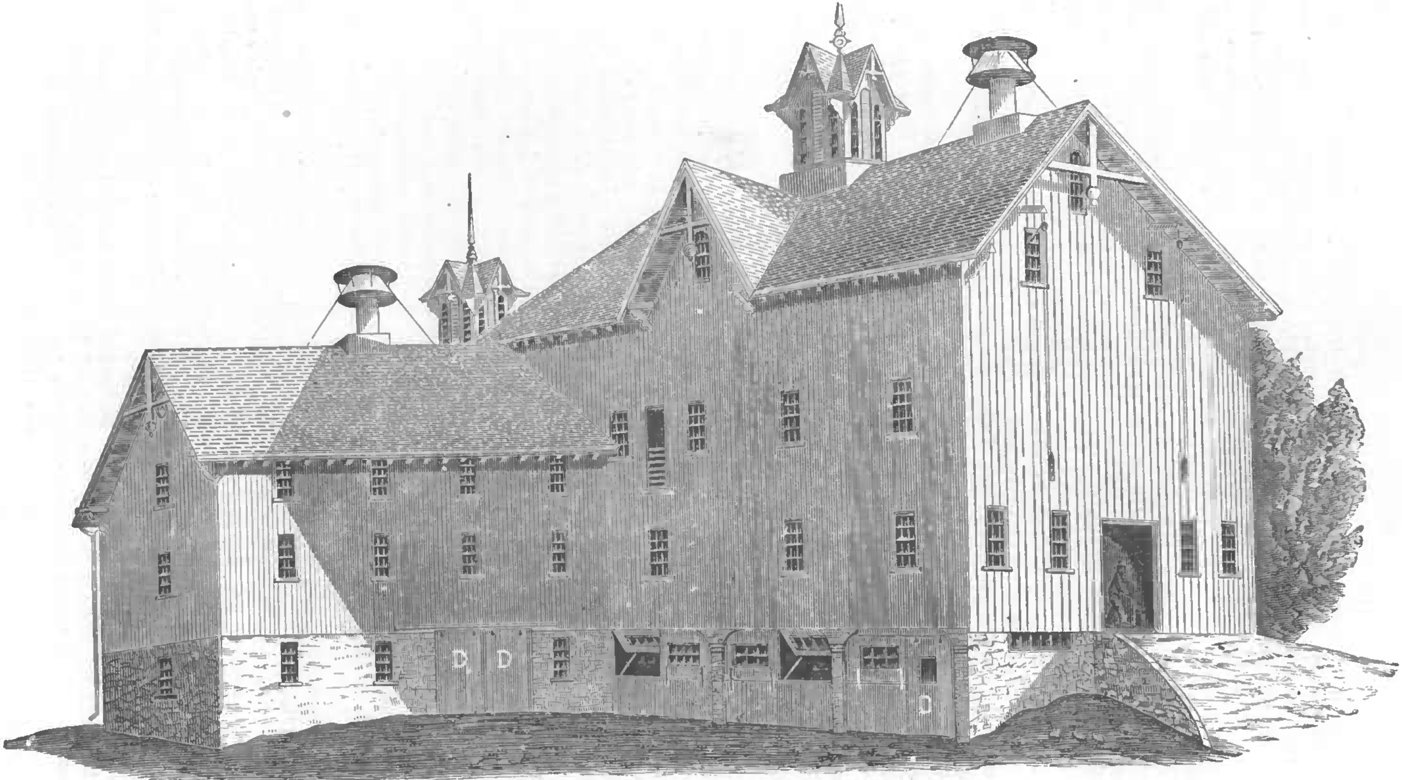
GENERAL PRINCIPLES.

A modern American barn upon a farm where a general mixed husbandry is practiced ought to include under one roof, or at least in one building, including wings, all the accommodations furnished by the collection of buildings which usually form so nondescript a group around any old farm homestead. Associations may cluster around the old hearthstone which has warmed half a dozen successive generations, which might lead to the maintenance in good repair of the old house, but no such claims to consideration can save the inconvenient old barns and sheds. One good building takes the place of a score of others of all ages and as diverse in character as ingeniously inconvenient. This building is the common shelter for the garnered crops, for stock, tools, and manure. It must be arranged to save labor to the last extent; that is, to make little labor and time on the part of farm hands go as far as possible. To this end both the coarse fodder and the grain should be stored above and pass naturally and easily downward to the stock, the former, if desirable, being chopped, and the latter ground, before reaching the feeding floor. The law of gravitation should again be employed to save labor in cleaning stables and collecting the manure in the cellars.

It matters little how careful and excellent the hired men may be; daily inspection by the proprietor or some responsible person is imperative. This must be thorough, and in a well-planned barn it should be very easily and quickly made. The construction and arrangement of all the interior should be so simple and adapted to its ends that it will be easier for the hands to keep everything right than otherwise, and such also that every tool out of place, every uncleanly spot, or slighted piece of work, will show itself to the inspector and enter a complaint against the negligent servant.

Light is exceedingly important to the health of animals and to the convenience of laborers, as well as to the accuracy of the inspection. Besides, plenty of windows will obviate the necessity of lanterns in winter fully an hour a day, morning and evening, thus avoiding no little danger from fire. In barn-building we soon reach the limit of large, square, or nearly square, structures, and in

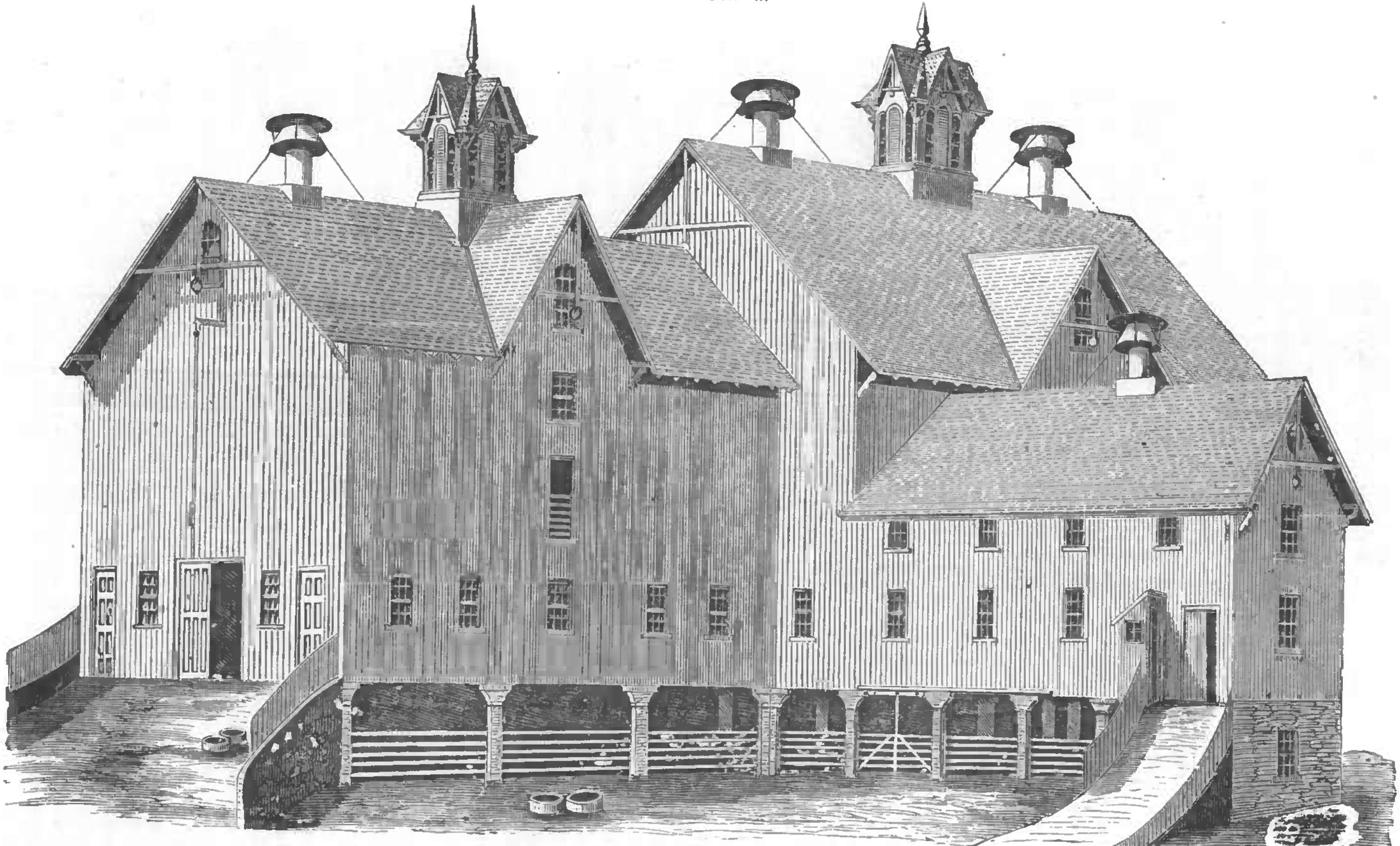
FIG. 2



Northeast View.

PLATE XXXV.

FIG 3.



Southeast View.

PLATE XXXVI

Mr. Lyman's barn, if for no other reason, the desirableness of light for the breeding stock would have led to the throwing out of the wings for their accommodation, and which may be indefinitely extended should the farm become capable of carrying a much larger number of animals than at present.

Fresh air kept in a barn is perhaps more important than anything else for the health of stock. In respect to provision for the most thorough ventilation of all parts of the structure this barn may be regarded as a model. Flowing water on the feeding-floor, and in the yards, is a convenience which can hardly be overestimated, and in a cold climate especially its value is very great. There is great danger of cows and unshod cattle hurting themselves in being driven over icy paths to water, and it is a vast saving of labor to have an unstinted abundance at command wherever it is most needed. Mr. Lyman has it brought in pipes from an unfailing source and delivered on the stock floor and in the yards.

DESCRIPTION OF THE BARN.

To gain an idea of the building the reader will do well to glance first at the ground plans, Figs. 4, 5 and 6, and then at the perspective elevations. It will be observed that the barn stands upon a side-hill, which slopes to the east; that there are three distinct floors, and that the structure consists of a main building and two wings, in dimensions as follows: Main building 55 by 80 feet; the east wing is 56 feet long and 31½ feet wide; the south wing is 56 feet long and 35 in width; total length from north to south, 136 feet.

Fig. 1 gives a view of the barn from the northwest, showing entrances to two floors. The drive-ways to the hay or storage floor rise gently to reach the required height, and are walled by substantial masonry. The enclosed spaces next the building shown in Fig. 1, and indicated by dotted lines in Fig. 6, are areas to afford light and air to the stock floor. The hay and grain lofts are furnished throughout with plumbs, hay forks, and travellers, there being not less than six railways for the travellers carrying the forks to run to and fro upon The fork at work, Dedrick's hoisting machines, and the weights and pulleys which are used to pull back the empty fork, are seen in the engraving. The approach to the stock floor is by a slight decline from the road, and the arrangement is such that a vehicle may be conveniently driven in at one door and out at the doors in either the north or south end of the building.

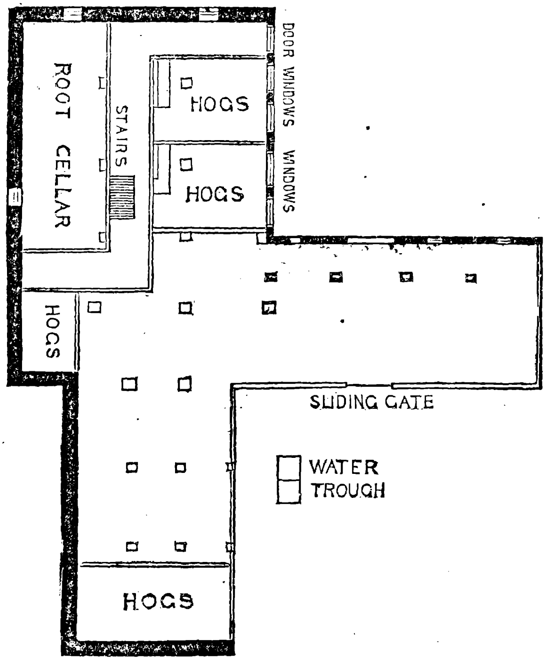
Fig. 2 is the view from the northeast. We see here the east wing and the cellar or basement wall, with the doors and windows communicating with the hog-pen, &c., as shown in the ground plan, Fig. 4. The doors (D) are suspended upon rollers upon which they slide. The windows are suspended by hinges from the top, and swing open inside.

Fig. 3 is the view from the southeast, showing the cattle yards, both wings, the cellar, &c. The approach to the cattle door of the east wing is not as steep as it appears in the drawing. Circular tanks of boiler iron are filled with constantly flowing water in each yard. The rail fence and gates shutting off the cellar from the yard are movable; the posts at either end being "stepped" into sockets, like mortices, left in the wide bases of the brick piers. Two men in a few minutes will remove them all and throw cellar and yard together, thus giving the cattle shelter in either winter or summer. Any portion of the cellar may, in the same way, be fenced off or opened to the yard.

Fig. 4 is the ground plan. The heavy black lines indicate the stone wall, which, in part, supports the bank of earth on the up-hill side. At the ends, where the cellar floor is about on a level with the surface, the wall is laid 2½ feet lower; at other points not so low. Under the outer edge of the entire foundation drains are laid with a grouting of stones and cement over them. These prevent any undesirable effects of frost. The whole floor is grouted three inches deep with stones, topped with sharp gravel, and covered with cement. The

swine are permanently confined in the pens, in which indications of feeding troughs are seen, but are allowed the range of the entire space beneath the wings

Fig. 4.

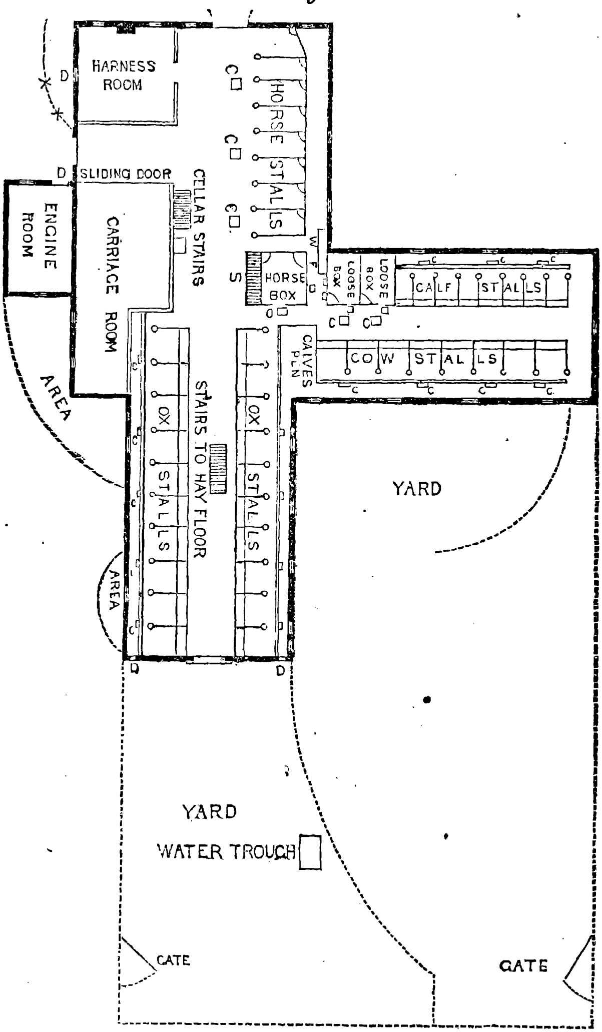


whenever it is desirable. The only thing peculiar about the hog-pens is the exceedingly simple arrangements for feeding. Common wooden troughs are set upon wide movable platforms; these are too heavy for the hogs to move; they are easily kept clean, and if anything is spilt it is not wasted, but falling upon the platform is eaten up. The cellar is arranged so that it may be divided by cross-partitions in any way that may be convenient. Part may be used for cattle part for tools or carts. A root cellar, 18 by 50 feet, on this floor, affords storage for about 6,400 bushels of roots, safe from frost and not warmer than the adjacent earth. This cellar may be subdivided into three or more bins. The roots are put in by chutes.

Fig. 5 is the plan of the stock or feeding floor, nine feet four inches high in the clear passing in by the western door, where the horses and wagon are seen entering in Fig. 1. We have on the right a very large carriage room, shut off from the floor by an immense sliding door. On the left is a neatly finished room called the harness room, in which is a stove for warmth in cold weather; immediately in front are the horse-stall, and on all sides the spacious floors where horses are cleaned, and where horses harnessed to vehicles may be tied. There is a clear passage through the barn from the north to the south end, the stairs to the hay floor being lifted and fastened up out of the way. The wings are occupied by cattle stalls; those in the south wing being wide and calculated for fattening oxen; those in the east wing adapted to cows and young stock. In the rear of the cattle stalls a double line indicates the channel for collecting the liquid manure, and the points marked *c* are openings through which the manure is dropped into the cellars. The letters *w* and *f* show the position of the water trough, and the trough for mixing the feed. The cattle have access to the yard through

small doors, marked D, in the south wing, and where the curved dotted line near the end of the east wing indicates the inclined plane by which they pass to the

Fig. 5.



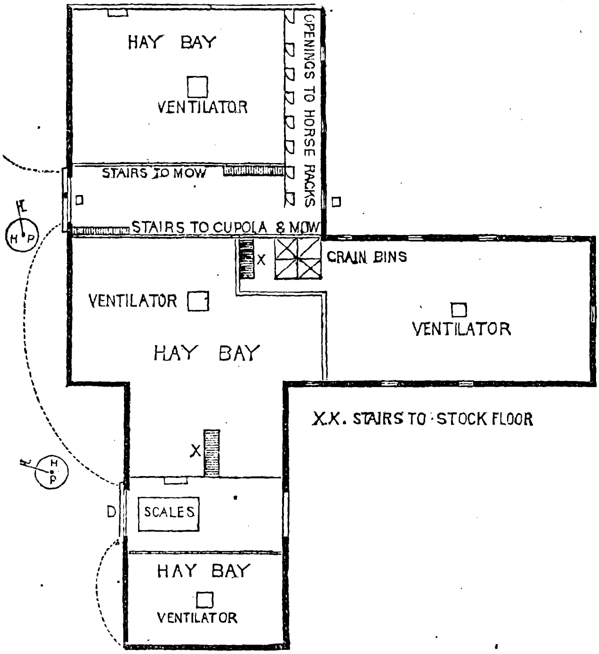
yard. There is an arched vault, well lighted, under the drive-way and entrance to the threshing floor of the main building. This is perfectly fire-proof, and forms a commodious boiler and engine-room, with space for considerable fuel. The steam pipes for cooking the feed pass through holes in the wall upon the feeding floor.

At present horse-power is employed for threshing and sawing, hay and stalk-cutting; but the plan is to employ steam power eventually as the most economical, the waste steam to be used for steaming hay and roots, and to this end the location of the engine-room, contiguous to and below the threshing floor, is exactly right.

Fig. 6 is the storage floor. Here all the hay, grain, straw, and stalks are

stored. Two threshing floors, 16 feet wide, cross the building, being entered from the west. On one of these is a hay scale, and there is abundant room upon

Fig. 6.

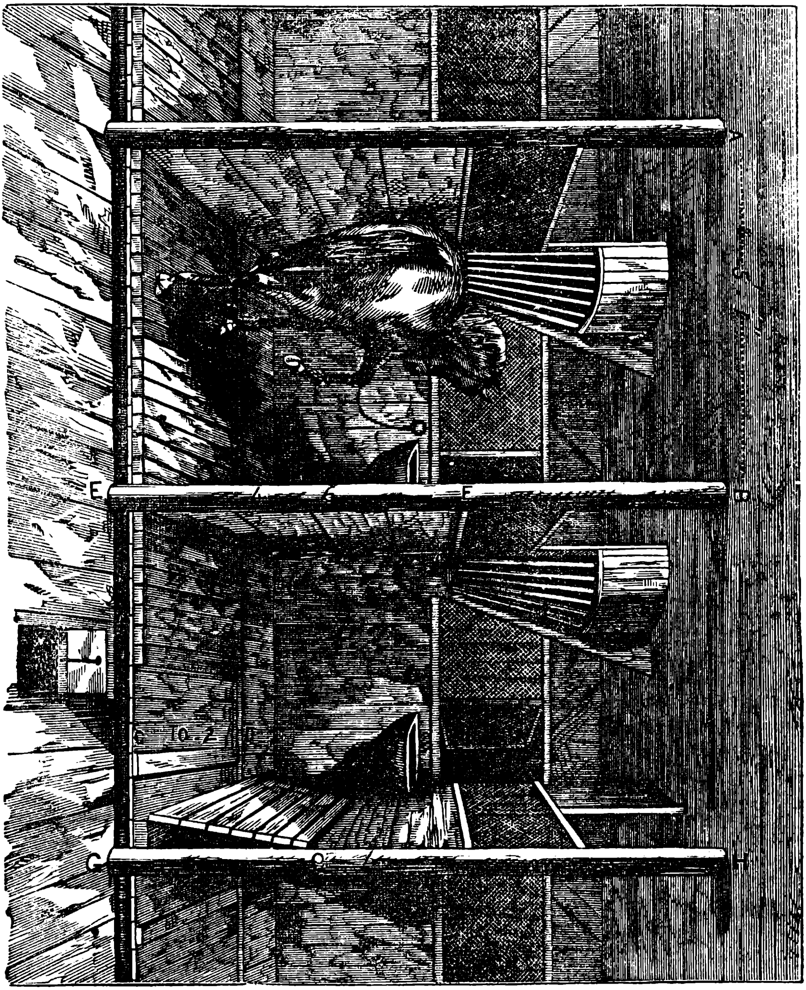


the other for a horse power and hay cutter, by which most of the coarse fodder is chopped up before being delivered at the feed trough on the floor below. Each grain and meal bin communicates by a chute with the feeding floor, where its contents may be drawn off. The greater part of this floor is occupied by the immense hay mows through which pass the four great ventilators coming from the feeding floor. Doors open with the ventilating trunks at different heights, so that, when desirable, hay, straw, oats in the sheaf, &c., may be thrown down to the stock. From this floor there are stairs which ascend to the cupola or observatory, from which an extensive view is had of the farm and of the surrounding country for many miles.

The horse stables throughout the barn are very airy and roomy. There are three loose boxes as shown in Fig. 5, one 12 feet square, for horses, and two somewhat smaller, which are used for horses, or as lying-in stalls for cows. The horse-stalls are models of convenience and excellence. They are shown in Fig. 7. Each has the following dimensions: 10 feet from front to rear, five feet one inch wide, nine feet four inches high. The stalls are separated by plank partitions 4½ feet high, surmounted by strong woven-wire cloth extending two feet higher. The same style of partition forms the front of the stalls. The hay-rack is of iron in one corner, and an iron feed box is in the opposite corner, accessible to the groom from the passage way in front of the stalls by a small door in the wire cloth. There are two floors, the lower one being laid of 2-inch chestnut plank, with cleats, half an inch thick, covering the cracks between the planks. Upon this water-tight floor is another made in three parts; for two feet at the upper end the floor is of white oak plank nailed fast; the rest of the floor is formed of narrow oak plank fastened together by strong oak cleats let in flush

so as to form two doors, as it were, hinged at either side, so as to be lifted and set up, as shown in Fig. 7, for the perfect cleansing of the lower floor. A chan-

Fig. 7.



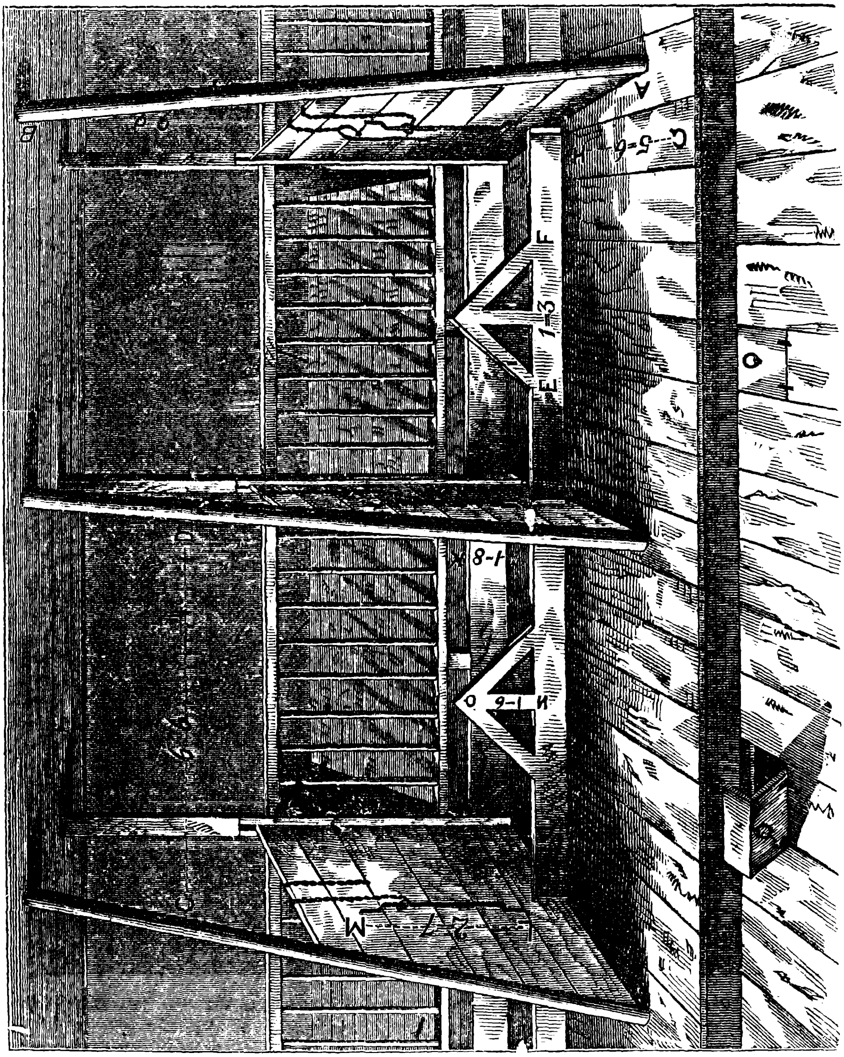
nel at the rear carries off the urine, and the solid manure is thrown into the cellar through the trap-door seen open in Fig. 7, and indicated by *c c c* in Fig. 5.

CATTLE STALLS.

Between the cattle stalls in the south wing (Fig. 5) there is a passage way ten feet wide, through which carts with green food, roots, &c., may be driven, making a complete system of soiling in summer practicable and convenient. The passage way through the east wing is not quite so wide, but might easily be used in the same way. All the cattle stalls are made upon the same principle, though of different sizes, for fattening cattle, milch cows, and young stock. The cow stalls are represented in Fig. 8. The feeding boxes are $2\frac{1}{2}$ feet wide, the floors $5\frac{1}{2}$ feet from the feeding trough to the gutter, which is 14 inches wide

and the passage in the rear is 3 feet, making in all about 12 feet for the stalls. The stalls are 6½ feet wide, arranged for two animals, which are fastened by a neck-

Fig. 8.



strap or chain attached to a short chain and ring, playing up and down upon a rod bolted to the partition between the stalls, as seen in Fig. 8. A perpendicular rack is in front of the manger, and a shutter (seen open in Fig. 8) is hinged below it, and when open is held in an inclined position by a chain. This affords space for a good forkful of hay between the shutter and the rack. Great economy of space is thus secured, for the encroachment upon the gangways is rarely of any inconvenience, and when carts are driven through it is easy to close the shutters.

Light and air are abundantly provided for the stock, as any one may see by even a casual inspection of the plans. In fact, these are the first features that

impress any one. The ventilating trunks are four feet square, and rise from the feeding floor directly to the roof, where they terminate in Emerson's ventilators of the largest size. The current of air caused by one of these is at all times perceptible, and usually amounts to a considerable wind. The windows on the stock floor are very numerous, and are each provided with two glazed sashes, hung by weights, so that any one, or all, may be opened to any degree desired, making the floors cool and airy in the closest weather.

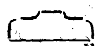
The yards open to the south and east, and are so arranged that the wash may be turned to flow into tanks for wetting down the manure in the cellar, which operation is frequently necessary, especially in summer. The water from the eaves is all conducted off, none comes into the yard, and there is no necessity for husbanding it.

CONCLUSION.

The editor of the American Agriculturist, who is familiar with the barn, thus writes concerning it:

It is exceedingly roomy and comfortable for men and beasts at all seasons. It thoroughly protects animals and their fodder, with all farm products, implements and manure, from the weather; effects great saving of labor; is subject to easy and rapid inspection; and, not least, it is easier for hired men to keep it clean and in order than to do otherwise. Neither care nor expense has been spared to make the whole structure as substantial and convenient as possible, the material being all of the best quality. The whole subject has been under consideration, and the general plan formed for several years. Mr. L. did not build until he felt sure he knew exactly what he wanted, and was ready to secure this to himself and his children at any reasonable cost.

The proprietor furnishes the following memoranda:

Lower timber, white oak, 12 by 14; joists, chestnut; floor, chestnut; rest of the frame, white pine, hemlock and spruce, mainly hemlock; the long cross-beams 55 feet long, squared 12 by 14 inches, are pine; threshing floors, $2\frac{3}{8}$ inch pine plank, grooved, with a tongue inserted; bay floors, $1\frac{3}{8}$ inch pine, planed and matched, laid planed side down; siding is pine, 10 to 12 inches wide, planed and matched, with battening of this  form, which costs no more than plain. The roof is $1\frac{1}{4}$ inch, planed and matched spruce, well slated, furnished with Otis's lightning rods. The architect is R. G. Russell, New Haven; the builder Henry E. Woodward, Thompsonville, Connecticut.

The gables on the sides of the barn and south wing give great strength to the frame, afford light to the floor, and in summer give a splendid draught of air over the floor, to say nothing of the beauty added to the building.

A cheap barn can be built on this general plan of, first, basement for manure, roots and hogs; second, floor for stock, wagons, and tools; third, floor for hay, grain, hay-scales, &c.; and I believe that a farmer may get for the same money one-third more room than by the old plan.

PHILADELPHIA BUTTER.

HOW IT IS MADE.

"Philadelphia print" is known in the central cities of the United States as butter unsurpassed for sweetness, solidity, and golden color. It always commands a fancy price, and is ever sought with an avidity that makes its sale a pleasure rather than a labor. Excellent butter is found elsewhere, as in New England, New York, and northern Ohio, but inferior qualities are the rule in the dairy sections proper, which these exceptions only prove; while in a large portion of the west and south there is very little superior butter, a considerable quantity that is passably good, and a large amount not fit to eat, of less value for cooking than good lard, and unworthy of the repute of the American farmer.

Greater advances have of late been made in cheese-making than in the art of

butter-making. The factory system has secured uniformity with positive progress in processes and knowledge of principles. Butter dairies are individual and isolated, and excellence in their product is the result of peculiar care in the manager, and special adaptation to his business. It is of the utmost importance that the very best modes of manufacture should be understood; that the dairyman and the farmer's wife who cares for the smaller dairy of the ordinary farm should compare their processes (which they may now deem to be the best because they know no other better) with those of model establishments, and learn to stamp a higher excellence upon the yield of their dairies. The difficulty of obtaining really good butter in the city markets appears to be increasing, probably from a growing fastidiousness of butter eaters as well as from the increasing disproportion in numbers of consumers and producers. This fact gives urgent and immediate importance to efforts for improvement.

The best Philadelphia butter comes mainly from Chester, Lancaster, and Delaware counties. A committee of New York gentlemen recently visited several of the dairies of Chester county as representatives of an incipient organization, the "American Jersey Cattle Club," designed to facilitate the work of publishing such a record of importations and pure breeding as should secure the integrity of this famous dairy breed.

The following extracts from their report, written by George E. Waring, jr., commence with a description of the dairy of Samuel J. Sharpless, of Street Road station, in Chester county, whose cows are all thoroughbred Jerseys:

The milking house is a light wooden structure, with so many open doors and windows that it is hardly more than a shed. In the winter it is closed up and used as a stable for young stock. In size it is about 22 feet by 36, with a row of stanchions on each side, and with mangers in which a little bran is put at each milking time. Each cow has her own place, with her name, age and pedigree over her manger, and she always goes to it as though she could read. Their names have been put up in the order in which they come from the pasture, the "master" cow entering first, and the least plucky last.

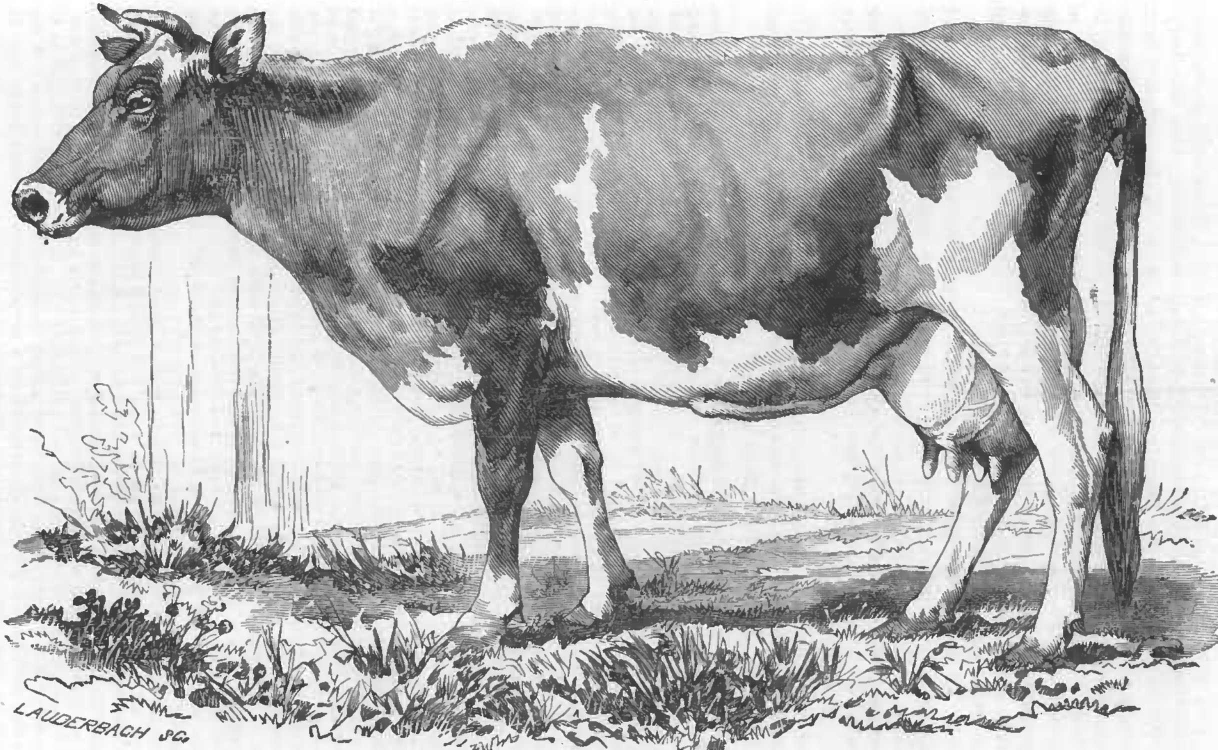
The milking is done by women, the same one always attending to each cow, and it is done rapidly and quietly, no unnecessary talking and no skylarking being allowed. We measured "Niobe's" yield, and found it to be 11 quarts, (she gave 9 the next morning—making it 20 for the two milkings,) not bad for a butter-making Jersey cow. The others gave less—the smallest not more than 8 quarts at two milkings—but the whole herd of 18 cows could not have given less than 200 quarts a day, and this of milk that yields over 20 per cent. of cream.

Near by the milking house is the "spring-house," the institution of this region, about 24 feet long and 18 feet wide, built of stone, with its foundation set deeply in the hillside, and its floor about four feet below the level of the ground at the down-hill side. The site is that of a plentiful spring, which is allowed to spread over the whole of the enclosed area to a depth of about three inches above the floor of oak laid on sand or gravel. At this height there is an overflow by which the water passes to a tank in an open shed at the down-hill end of the house. On the floor of the spring-house there are raised platforms or walks to be used in moving about the room, but probably three-quarters of the space is occupied by the slowly-flowing spring water. The walls are about 10 feet high, and at the top on each side are long, low windows, closed only with a wire cloth, which gives circulation of air at the upper part of the room. The milk is strained into deep pans of small diameter, that are kept well painted on the outside, and are provided with bails, by which they are handled. The depth of the milk in the pans is about three inches, and they are set directly upon the oak floor, the water, which maintains a temperature of about 58° Fahrenheit, surrounding them to about the height of the milk.

The cream is taken off after 24 hours, and is kept in deep vessels having a capacity of about 12 gallons. These vessels are not covered, and as the room is scarcely warmer than the water, the cream is kept at about 58° or 59° until it is put in the churn.

Churning.—The churn is a large barrel, (bulging only enough to make the hoops drive well,) with a journal or bearing in the centre of each head, so that it may be revolved by horse power. This barrel has stationary short arms attached to the inside of the staves, so arranged as to cause the greatest disturbance of the milk as it passes through them in the turning of the churn. At one side is a large opening secured by a cover that is screwed firmly into its place—this is the cover or lid of the churn. Near it is a hole less than an inch in diameter, for testing the state of the churning and for drawing off buttermilk. This is closed with a wooden plug.

The churning lasted about an hour, at the end of which time it was necessary to add a little cold milk, to cause the butter to gather. This being secured, and the buttermilk drawn off, cold water was twice added, a few turns being given each time to the churn, and when the



DUTCHESS.
Imported Jersey Cow, owned by CHARLES L. SHARPLESS, Philadelphia, Pa.

PLATE XXXVII.

last water was drawn off it came nearly free of milkiness. A crank was then put on to an arm of the churn, the horse-power thrown out of gear and a gentle rocking motion caused the butter to be collected on the lower side, directly over the small hole—through which the remaining water escaped. It was left in this condition about two hours. After breakfast we returned to see the working of the butter.

The butter-worker.—In one corner of the spring-house stands the butter-worker, a revolving table about three feet in diameter. The centre of this, for a diameter of 12 inches, is an iron wheel with a row of cogs on the upper side of its rim. From this rim to the raised outer edge, the table (made of wood) slopes downward, so that the buttermilk as worked out is passed into a shallow groove and is carried away through a pipe which discharges into a pail standing below. Over the sloping part of the table there works a corrugated wooden roller, revolving on a shaft that is supported over the centre of the table, and has a small cog wheel that works in the cogged rim of the centre wheel, and causes the table to revolve under the roller, as this is turned by a crank at its outer end. Of course the roller is larger at one end than the other, so as to conform to the slope of the table, and its corrugations are very deep, not less than two inches at the larger end. Supported at each end of the roller and on both sides are bevelled blocks which, as the table revolves, force the butter from each end toward the centre of the slope. About 20 pounds of butter is now put on the table, and the roller is turned, each corrugation carrying through a long narrow roll, which is immediately followed by another and another, until the whole table is covered. The roller does not quite touch the table, and there is no actual crushing of the particles. The bevelled blocks slightly bend these rolls and crowd them toward the centre of the sloping part, so that when they reach the roller they are broken in fresh places, and by a few revolutions are thoroughly worked in every part.

Final processes.—Then follows a process that was new to all of us—the "wiping" of the butter. The dairyman turning one roller backward, with the left hand, so that the butter comes through at the right hand side, presses upon every part of it a cloth which has been wrung dry in the cold spring water, and which he frequently washes and wrings out. This is continued until not a particle of water is to be seen in the butter as it comes from the roller, to which it now begins to adhere. If there is any secret in the making of Philadelphia butter, this is it; and it has much to do with the uniform waxiness of texture, whether hard or soft.

After this the butter is salted, (an ounce of salt to three pounds of butter,) still by the aid of the machine, and any lurking atom of moisture is in this way prevented from becoming a cause of rancidity.

When the salt is thoroughly worked through the whole mass, the butter is removed to a large table, where it is weighed out and put up in pound prints.

The working, wiping, and salting of over 100 pounds of butter occupied about an hour, and before 10 a. m. the entire churning, beautifully printed, as fragrant as the newest hay, and as yellow as pure gold, such butter as only Jersey cream will make, was deposited in large tin trays and set in water to harden. The next morning it was wrapped in damp cloths, each pound by itself, put in a tin case, each layer having its own wooden shelf, with two compartments of pounded ice to keep it cool, and, surrounded by a well-coopered and securely locked cedar tub, was sent to the Continental Hotel, where we found it on our return as delicious as when it left the farm.

It is very difficult to describe any process in which so much depends on the judgment of the operator, and the writer hardly hopes for more than that his example will stimulate others who are interested in the subject to examine for themselves the daily operations of this interesting and beautiful region.

West Chester farms.—Having seen our friend's butter safely set away to cool, we started on an excursion among the more successful dairymen in the vicinity of West Chester, stopping by the way to visit another farm where only Jersey cattle and their grades are kept, and where the dairy operations evidently receive the same careful treatment, and where the milking house had been very much improved by being made two stories high, a loft for hay being thus secured at a very little cost.

One of the strongest impressions we had thus far received was that much of the excellence of the butter was due to the use of the spring-house; but our next visit (on the recommendation of a friend who gave us the names of the most noted fancy-price dairies) was to a farm where the milk was kept in a deep vault, arranged much like a spring-house, but without water. The proprietor of this farm, a man of long experience and of excellent reputation as a butter-maker, has satisfied himself, by a long trial of both systems, that the dry room is the best. He attributes the advantage to greater dryness of the air; but as, with a free circulation against the cold stone, the walls were covered with moisture, he had gained very little in this respect, even supposing, which is doubtful, that dryness would be a gain.

The thermometer on the wall of his vault was not more than one degree higher than that of the spring-house, and our impression was that a low and uniform temperature, however attained, is the important consideration. In the dairy that we were now visiting there were no shelves, and no provision was made for a circulation of air around the pans, as is considered important in the dairies of our own region. In the vault, as in the spring-house, the pans, which are equally deep and have even a greater depth of milk, (over four inches,)

were placed directly upon the floor. In this dairy the milk was allowed to stand 36 hours before being skimmed. The butter is worked and salted in the same way, and is equally good in its texture, and of very fine flavor. The color, however, it being thought desirable to bring it up to Alderney standard, was secured by the use of annatto, which is used winter and summer, to secure uniformity of color. A solution of the annatto is made by boiling it in water, and the extract is mixed with the cream in the churn.

From here we went to another farm in the vicinity of West Chester, which bears an equally high reputation for its butter, and where the spring-house has been abandoned, and the cream is kept, as previously described, in a dry vault. In the manufacture of the butter the same processes obtain, and the same good result is secured. In all of the instances described a very high price, much above that of the common market, is obtained.

The next morning we drove about 10 miles, through a magnificent farming country, to a farm which, more than any other, is celebrated in the Philadelphia market for the excellence of its butter. In fact, it is rather a butter factory than a farm. Cows are bought when in full milk, forced by a liberal use of purchased food to the highest yield of which they are capable, and are sold as soon as their milk fails. The farmer himself is his own dairymaid, and attends in person to every detail of his dairy. He makes use of the spring-house, and believes that it is necessary. His butter is worked on a table, with a large two-handled paddle, and when wiped and properly salted it is thrown in large lumps into a cloth, which lies in a vat of cold spring water; (ice water would do as well.) He claims that the hardening is more rapid and more complete when the water surrounds the lumps of butter than when surrounding a vat in which they are placed. He uses annatto, winter and summer, and gives a very high, though somewhat unnatural, color to his butter. He obtains the very highest prices in the Philadelphia market, and he supplies some of his customers by express at their summer residences at the seaside. His price during the whole of last winter, by contract for the season, was $1 per pound, and it is now 65 cents, when good butter is selling for 35 cents in the Philadelphia markets.

Chelten Hills.—From this farm we returned to Philadelphia and went to Chelten Hills, on the North Pennsylvania railroad, to visit the Jersey cows imported by Mr. Charles L. Sharpless. They were selected by Mr. Sharpless in 1865, on the island of Jersey, and have only now been admitted, in consequence of the danger that had previously existed of introducing the rinderpest. They are an exceedingly fine lot of cows, seven in number; one of them, "Duchess,"* is by far the finest animal that any of us had seen. She is now giving, by actual measurement, 21 quarts of milk a day, which yields daily more than four quarts of the richest cream, and she is as fine and delicate as a thoroughbred horse. Her color is brown and white, with the richest orange-colored skin under the white hair. Her horns are small, thin, and of a translucent amber hue, slightly tipped with black. After a long examination of her, our party broke up, being fully confirmed in our opinion that for the butter dairy the Jersey is, *par excellence*, the cow of all others to select, and satisfied that we had learned some things about butter-making that were worth the trouble of learning.

Another member of the committee writes as follows:

If one wishes to see the grazing and dairy business carried on with the neatness, the order, the elegance of a first-class commercial house, the *ne plus ultra* of cleanliness and taste in the dairy business, he should visit Mr. Sharpless's farm. He has 160 acres so disposed around the hill on which he has built that all the fields are under his eye as he stands on the slope south of his house. The farm buildings are in a valley at the rear of the house, protected from the winter winds and easily reached from all parts of the farm. He keeps from 20 to 25 Alderneys, and has what we saw at very few other places, a milking-house—a large and airy structure, with a hard clay floor well rammed, and stanchions with the name of each animal tastefully printed and nailed over the place where she regularly stands. This house is kept as clean as a dining-room. The cows remain there only during milking time, when a little green corn or other food is thrown in the mangers, so a cheerful entry and quiet standing are insured. Close by stands his milk-house, the walls about 10 feet high, 6 feet being beneath the surface. The floor is covered with oak plank, with a platform or walk raised four inches. Cold spring water stands or rather flows, with a depth of about three inches, all over the floor. In one place the depth of water is 8 or 10 inches. Here the great pails of cream stand till churning day. The temperature of the water and of the stone walls which rise from it is 52°. When closed, as it generally is, the temperature of the spring-house is about 56°, and varies very little whether people outside wear overcoats or are dropping down with the sunstroke. In fact, we may as well here disclose the grand secret of the Philadelphia butter, for we found the same rule observed at the establishments of John R. Penrose and of Marshall Strode, who live near Mr. S., and make first-class butter. *From the time the milk leaves the cow till the butter graces the table, milk, cream, and butter are near the temperature of* 60°. In churning, 62° is found the best figure for the mercury, The cream is kept as cold as possible. The skimming is done with a concave tin scoop. perforated with a great number of small holes. This separates the cream from the milk more perfectly than any other instrument or process. Milk is allowed to stand 36 hours before

* "Duchess" is presented in Plate XVIII.

skimming; the depth of the milk in the pans is generally two and a half inches; the same with the cool water on the outside of the pans. These people use the barrel churn driven by horse-power. Even in the heat of July, and through these dog-days, many of them churn but once a week, and never more than twice. J. R. Penrose manages his dairy farm much like his neighbor Sharpless. His spring-house is a little higher and the ventilation good. This is an important point. Cream is a great absorbent, and no ill odor of any sort should be allowed in a milk-house. If a gentleman happens to be smoking he throws away his cigar when he enters that cool and hallowed retreat, as though the dairymaid were the lady of the manor. Mr. P. feeds liberally, and takes a corresponding flow of milk. He finds, no matter how good the pasture is, a cow is never so full as to refuse a few stalks of juicy corn, a lock of fragrant clover, or an armful of green rye or millet, and such bon-bons and tit-bits never fail to stretch out the line of pans. Mr. Penrose, as well as Mr. Sharpless, keeps the Alderney. For a butter dairy there is no doubt of their superiority. Mr. S. has a cow that has given 18 pounds in a week. A pound a day from each cow is not much above the average. Milking 23 cows, Mr. P. made in one week 187 pounds of butter. This was at the flush in the middle of June. In August he makes from 130 to 140 pounds a week.

Marshall Strode does not follow butter-making as a fine art, but for money. He has a cellar 10 feet below the surface, well ventilated and cleanly. His milk is here kept at a temperature of about 58°. His cream he cools the night before churning with lumps of ice. Just before the butter comes he throws into the churn a bucket of ice-water. This gives him hard, close-grained butter, even in July. He sells it himself in the Farmers' market, and gets this year, on an average, nearly 80 cents a pound for all he makes. He can do what few farmers here or in England or Flanders can boast of. He will buy a fair native cow for about $65, and in one year she will pay for herself twice over in butter. He will agree within a twelvemonth to sell from her $130 worth of butter. The sour milk of a cow will make 100 pounds of pork, and her calf he sells for $8 or $10. Thus his cows, the common natives of the country, pay him about $150 a year. Can a butter-maker in Herkimer, or Ulster, or Orange, or Essex, make a better showing? How do those farmers get such a price for their butter? First, they *always* make a first-class article, so their customers, sure of getting the best there is, will not desert them on account of a rise in the price. Second, they bring in their butter in a showy and attractive condition. No pot of delf ware, no tub or pail of oak or hemlock, no vulgar firkin is used to entomb those noble balls, golden-hued, with the aroma of white clover and *Poa pratense* lingering in the firm grain. A large tin vessel, designed expressly for the business, has chambers at each end into which ice is put. Thin wooden shelves about three inches apart rest on little projections from the sides. A layer of balls is placed on the bottom and covered with its shelf, but not so as to touch or mar the handsome print of a sheaf of golden grain, which stands out on the top of each ball; on this shelf another layer of prints, and so on till the vessel is full, then containing 40 or 50-pound prints. The tin, with ice in each end, is then set into a wooden tub which has been cooled with ice or spring water. Over this is drawn a cover of padded carpeting, with oil-cloth on top. Thus hot air and dust are wholly excluded, and the butter rides to the city and opens in the market-house in as fine condition as when packed in the spring-house. In just this way, with this degree of care and skill, is the best Philadelphia butter made, marked, and marketed. No wonder the Philadelphians would rather pay 75 cents than go back from such manna to the leeks and onions of the common firkin.

The farmers of Chester and Delaware counties often discuss the relative profit of making butter and fattening cattle for the Philadelphia market. We drove back among the farmers on the Brandywine hills, the very hills over which Cornwallis made his flank movement when Howe got the better of Washington. Here they make little butter, but fatten many bullocks. Marshall Hickman and his son George, to give an instance, on a 160 acre farm can fatten 40 head, giving on an average $90 a head, and selling for $140. They are doing it this year. They contend that $2,000 is thus realized with far less care and labor than by making butter. But the farm in natural fertility has no superior in that region.

We visited other farms, as that of John Leedom, only seven miles from the city, who is getting 70 cents for his butter, and other cattle-feeders amid these beautiful and fertile hills. These farmers are cheerful; they are contented, sagacious, and thrifty. In their thorough tillage, their generous manuring, their solid fences, and noble barns, in the order and perfect tidiness of their dairies, and in the care and skill they show in disposing of the products of the farm, they set their brother farmers of New Jersey, New York, and New England a notable example.

HYBRIDIZING, CROSS-BREEDING, AND DEGENERATION OF PLANTS.

By Horace Piper, Biddeford, Me.

Few subjects are more interesting to the agriculturist than the hybridizing and the cross-breeding of plants, for to one or the other of these processes he is indebted for a great number of the most useful plants that are cultivated, either for the delight or the sustenance of man. On the other hand, his most sanguine expectations are often disappointed, and his best plans frustrated, from the want of a correct knowledge of the laws by which they are governed. It is for this double purpose, of showing how the most desirable plants have been produced and how others may be, and be preserved in their purity, that I have undertaken the preparation of this essay.

It will be necessary in order to comprehend fully the principles of these subjects, and their application to the practical operations of agriculture, to take a general view of the generative organs of the vegetable kingdom, and the manner in which they act in the reproduction of their particular species. If we examine attentively a perfect flower, we shall find that it consists essentially of two sets of organs, one called the pistils and the other the stamens. The pistils are located in the centre of the flower, and the stamens around them. The summit of the pistil is called the stigma, and on the top of each stamen is situated an anther, a small sack, which contains the pollen, or fine dust-like substance, that fertilizes the ovules or young seeds of the plant.

These organs are supposed to perform offices analogous to those of the animal kingdom: the stamens representing the male and the pistils the female organs. When the anthers, which contain the pollen, arrive at a certain degree of maturity, they suddenly open, and emit a multitude of minute grains of pollen, and these, falling on the pistils of the flower, throw out small hair-like tubes, which penetrate through the whole extent of the vascular tissue of the pistil and ultimately reach the ovules, thus fertilizing them and making them capable, when mature, of reproducing plants of their own kind.

The ovules are the rudimentary seeds, situated in a case at the base of the pistils, each consisting of a central portion, called the nucleus, which is surrounded by two coats, the inner called the secundine and the outer the primine. When the hair-like tube of the pollen-grain passes through the orifice in the coatings of the ovule, and reaches the nucleus, or embryo sack, it is supposed by Brongniart and others to emit a spermatic or plantlet germ, which passes through the wall of the embryo sack and enters the germinal vesicle contained in it. The vesicle corresponds to the germinal spot, or vesical, in the egg of birds, and the ovum of mammiferous animals. The germ remains in the vesicle, and finally becomes the embryo fully developed into a plantlet, as may be seen in the bean and other seeds.* These tubes sometimes grow to great length, and are many days in penetrating the whole length of the pistil. Indian corn *(Zea mays)* will furnish a good illustration. The pistils of this plant, which are commonly called "the silk," grow to the length of 10 or 12 inches, and yet these slender pollen-tubes penetrate the whole distance from the point where they come in contact with the pistils to the nucleus of each rudimentary seed. The ovules grow to a

* See Griffith and Henfrey's Micrographic Dictionary, under *ovule* and *pollen*, pp. 514 and 557; A. Gray's Botanical Text Book, p. 246; Alphonso Wood's Class Book of Botany, ed. 1860, p. 149.

certain size, natural to each particular plant, and, if they are not fertilized, then they wither and die; but when properly fertilized they grow vigorously, and, at last, become fully developed into perfect seeds.

Plants or the flowers of plants are called perfect when the stamens and pistils are in the same flower, as in the apple *(Pyrus malus;)* monœcious when in different flowers and on the same plant, as in the white oak *(Quercus alba;)* and diœcious when in different flowers and on different plants, as in the hemp, *(Cannabis sativa.)*

In the first class the pollen is conveyed from the anthers to the pistils in some cases by actual contact of the two organs, as in the potato, *(Solanum tuberosum;)* in others by the elasticity or spring of the stamens at the time the anthers emit the pollen, by which action it is scattered on the pistils, as in the mountain laurel, *(Kalmia latifolia;)* and still in others by the position or length of the stamens, being above or hanging over the pistils, and, therefore, requiring no accidental means to fertilize the plant.

In the second class the staminate flowers are generally situated above the pistillate and over them on the same stalk, so that the pollen falls upon the pistils by the mere force of gravity, as in the Indian corn before referred to, in which the part commonly called the spindle contains the staminate flowers, and the ears the pistillate.

In the third class the staminate flowers are on one plant and the pistillate on another; therefore, the pollen must be conveyed by some artificial means from the stamens to the pistils. This is readily accomplished by the wind or insects. The grains being light and very numerous, are easily wafted by the breezes and severer winds in sufficient numbers and to the necessary distances to accomplish the desired object. But, lest this mode of conveyance should prove inadequate, nature has provided another security just referred to, namely, the transmission by insects when in search of honey for their food. Passing from the flowers of one plant to those of another, often to great distances, they carry the pollen which has adhered to their legs and bodies, and deposit it on the pistils of the flower of another plant, which is thus rendered fertile, and is as certain of producing fruit as if the pollen actually fell upon the pistils from the anthers of the same flower. In this way we may account for the fact that some trees of this class, though thrifty and producing an abundance of flowers, do not bear any fruit. It is simply because there is no staminate plant sufficiently near from which pollen may be conveyed by any of the means above to the insulated plant. And, again, the plant may be so far distant as not to admit the pollen to reach it at all, or only on some extraordinary occasion, and, therefore, it would produce fruit only when such accident should happen to occur, which might never be. We have a very curious instance of the manner in which fertilization is sometimes effected in this class of plants in the case of the *Vallisneria spiralis*, in which the flower of the staminate plant detaches itself from its stalk and swims to its mate, attaches itself to it, and remains until it becomes fertilized, when both flowers wither and sink beneath the surface of the water in which they grew, the one to perish, and the other to mature seeds, and sow them on the muddy bottom below.

Plants are divided into genera, species, and varieties, a division which will be found sufficiently comprehensive for my purposes.

A genus denotes an assemblage of several species agreeing with one another in their structural characters more closely than with other species.

A species denotes a class embracing such varieties as may have originated from it as their common parent, and is capable of reproducing itself indefinitely.

A variety is an individual having originated from a species, and differing from it only in some minor particulars, as shape, foliage, color, or flavor of fruit, &c.

The whole subject may be illustrated by a single genus, the *Pyrus*, which includes the species called the apple *(Pyrus malus,)* the pear *(Pyrus communis,)*

and many others. The species called the apple includes many varieties, as the Baldwin, Greening, Russet, &c.

Hybridizing of plants consists in fertilizing one species or one of its varieties with the pollen of another species or one of its varieties of the same or a different genus. The offspring is called a hybrid, or mule.*

Cross-breeding of plants consists in fertilizing one variety with the pollen of another variety of the same species. The offspring is called a cross-breed, or variety.†

Hybridization takes place between two species of the same genus when they are nearly allied to each other, but not often between those of different genera, since they are generally remotely related. It is not possible, however, to ascertain by the external or the internal characters the exact relationship which plants bear to one another, and it is sometimes the case that the species which are classified in botany as belonging to different genera are physiologically more nearly allied than those of the same genus. Therefore, experiment alone must determine what plants will hybridize, and what will not. The Dean of Manchester hybridized the *Rhododendron Ponticum* with the pollen of the *Azalea Pontica;* M. Sageret, the radish *(Raphanus sativa)* with the pollen of the cabbage, *(Brassica oleracea;)* and Wiegman, the English garden bean, *(Vicia faba,)* with the pollen of the lentil, *(Ervum lens.)* But these hybridizations are not common, and it may be laid down as a general rule that hybridization is confined almost entirely to species of the same genus, and these also must be nearly related; for, after all the efforts of eminent botanists to hybridize the apple *(Pyrus malus)* and the pear *(Pyrus communis,)* it has never been accomplished, however desirable it may be, and the idea has been abandoned as involving one of those fixed principles of nature the boundaries of which man can never pass. The currant and the gooseberry, too, the blackberry and the raspberry, have never, according to Professor J. Lindley, been hybridized, and probably never can be; although, like the apple and the pear, they belong to the same genus, and so much resemble each other in their appearance and physiological structure.

It might, at first view, be supposed from what has been said that the field of labor assigned to the experimenter in hybridization is very much circumscribed, being confined, as it is, to only one class of plants, and this principally the different species of the same genus. But, when we consider that the whole vegetable kingdom is made up of species and their varieties, which are only grouped together in larger classes under different names, we shall see that it is vast in extent and unlimited in variety, and will give the broadest scope to the most exalted genius. And, although much has been already accomplished, we may yet suppose that there are multitudes of forms shut up in the arcana of nature which are yet unborn, and may at some future day come forth to beautify still more the face of nature, furnish new pleasures for the eye, and provide more delicious food for the sustenance of man.

The process of hybridizing and cross-breeding plants is the same, and consists in applying the pollen taken from the anthers of the staminate flower to the stigma of the pistil or pistils of another flower in such a manner as to effect its fertilization. The manipulations employed in the operation are generally simple and easily understood. They are performed by cutting away the stamens of the flower to be fertilized a short time before they arrive at maturity, and taking the staminate flower from its parent stalk, holding it in the right hand, and then striking it on the finger of the left, held near the flower; thus scattering the pollen on the stigma of the pistil of the flower to be fertilized. Or it may be done with a delicate camel-hair brush by first applying it to the pollen, and then passing it carefully over the stigmas of the pistils of the flower upon which the operation

* Hybridizing, strictly speaking, is obtaining a progeny between different species.—Johnson and Landreth's Dictionary of Modern Gardening.

† Cross-breeding is obtaining a progeny between varieties of the same species.—Ibid.

is to be performed. In both cases the utmost care must be taken to apply the pollen when the flower is in its greatest vigor and beauty, and the stigma is covered with the necessary coating of mucus to insure a perfect connection of the pollen with the pistil, and make the fertilization perfect. The pollen also should have arrived at the proper degree of maturity, which occurs when it is about to fall from the anther. These conditions can be known with a good degree of certainty to the operator by the naked eye or a good magnifier. All flowers not wanted in the experiment should be removed some time previous to the operation, or before any pollen has been formed. It is also necessary to tie a thin piece of gauze over the flowers which have been fertilized in order to prevent insects from conveying pollen to them, and thus frustrating the labors of the operator.

Another difficulty sometimes presents itself in the fact that both plants do not mature their flowers at the same time. There is not much trouble when the staminate flowers mature first, for the pollen can generally be kept for a considerable time if properly preserved. M. Harquin, of Liege, has fertilized flowers of the azalea with pollen kept six weeks, and those of the camellia after it had been kept seven weeks; and the pollen of the rhododendron has been known to retain its fertilizing power for twelve months. M. Harquin took the anthers from the flowers just before they opened, and having wrapped them in paper left them in a dry room for a day, and then collected the pollen they contained in sheet-lead and preserved it in a dry place. A small box made of the same substance would be more convenient. But when the pistillate flower matures first, it must be kept back by cold or some other means, and the staminate flower must be forced in order, if possible, to bring them into flower at the same time. In the hot-house this can often be accomplished by ingenuity. In out-door plants there would be more difficulty, and perhaps it might be necessary to obtain pollen from some warmer climate where the flowers mature earlier.

And, further, in some plants, as in the grape, the fertilization is effected either before or at the time when the cap of united petals is thrown off from the stamens and pistils. In such cases it must be carefully removed by forceps or scissors, and the stamens cut away when it first separates from the receptacle, and the pollen applied as soon as the pistils are in condition to receive it. It may be known whether the operation has been successful by examining the pistils after the pollen has been applied. If it has been perfect the pistils will soon begin to wither; if not perfect, they will continue fresh and full for some days.

From what has just been said, a practical suggestion may be drawn in respect to the time most proper for cutting plants intended for the support of animals, or for medicinal purposes. It is a fact that a plant is in its fullest vigor, and contains the largest quantity of nutritious juices, which are laid up in store for the growth of the young seeds, when the flower is in its greatest perfection, and the pollen is fully matured, and commences its fertilization. This condition may be known by observing, in the larger flowers, the pollen scattered on the stigmas; or in the smaller ones, as the grasses, by striking the spike or head, when the pollen will appear like yellow dust on the hand. This is the time the plant should be cut and stored away for future use. If delayed beyond this, the nutritious elements are abstracted to perfect the seeds, and the plant gradually becomes a withered, dry, and tasteless stalk. All the grasses, whether upland or lowland, should be cut at this time, as the increase of the seeds will bear no comparison in value with the loss of the nutritious properties of the stalk and flower. It seems almost cruel to deprive domestic animals of the sweet and nutritious new mown hay by failing to cut it in season. The same reasoning applies to medicinal herbs.

It has long been a disputed question whether a hybrid has the power of propagating offspring. Mr. T. A. Knight, late president of the Horticultural Soci-

ety of London, Professor J. S. Henslow, and other distinguished botanists, think that a true hybrid is incapable of reproducing itself, although it may be fertilized by either of its parents, and, if these fertilizations are continued through a few generations,* the offspring will at last return to the type of the species by which the fertilization was effected. Mr. T. A. Knight says:

> I have never yet seen a hybrid plant capable of affording offspring which had been proved by anything like satisfactory evidence to have sprung from two originally distinct species.—Horticultural Papers, English edition, p. 253.

There are others, among whom are Professor Gärtner, Professor J. Lindley, and Professor Asa Gray, who suppose that there are different degrees of hybridity, and that hybrids may sometimes be capable of reproduction for a few generations, but that their sterility will soon manifest itself, and they will die out if not previously absorbed into one or the other of their parents. Professor J. Lindley says:

> Two distinct species of the same genus will often together produce an offspring capable of performing all its vital functions as perfectly as either parent, with the exception of its being unequal to propagating itself permanently by seed; should it not be absolutely sterile it will become so after a few generations.—Introduction to Botany, p. 348.

Professor L. Agassiz says of hybrids:

> Their fecundity is limited,—sometimes so extremely limited that even the first generation is sterile; sometimes partially fertile by a return to the parent stock. Between themselves, the individuals born from two different species are hardly ever fertile without limit.—Massachusetts Agricultural Report for 1864, p. 135.

There is still another class represented by Rev. W. Herbert and Mr. Charles Darwin, who say "some hybrids are perfectly fertile,—as fertile as pure parent species," and that new and permanent species may be produced by hybridization.

From the preceding observations it seems to be a reasonable conclusion, which may be adopted as a rule, that sterility is connected with hybridity, and, if it is not complete in the first hybrid, it will be in some of the subsequent generations. It would seem, also, that in some instances, as stated by Rev. W. Herbert and Mr. Charles Darwin, that different species do sometimes produce fertile offspring, but that these cases are very few. Now, it is acknowledged by the best botanists that many plants which are classified as species are only more permanent varieties, and that if a classification were made on physiological principles of affinity they would be classed as varieties. Therefore these hybrids are such only by classification, and are properly the offspring between two varieties of the same species, and should be called cross-breeds, or varieties. In this view sterility is made a test of hybridity, and, if we adopt any other opinion, all distinction between hybrids, species, and varieties will be destroyed, and the theory of transmutation† must be adopted.

The advocates of original species suppose that the different species were all created in the beginning, and that no others have been created since. They admit the effect of different modes of living, kinds of food, and climate; but they deny that these are sufficient to produce a new species. Among the most able advocates of this theory are Baron Cuvier, Professor L. Agassiz, Professor J. Lindley, Sir C. Lyell, Professor E. Hitchcock, and Professor J. D. Dana.

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* Beginning with the hybrid, the children are the first generation, the grandchildren the second, and the great-grandchildren the third.

† The theory of transmutation supposes that only a few forms of plants and animals were created at first, and that all the others have originated from them, the changes having been produced by different modes of living, kinds of food, climate, &c. Thus, suppose two birds to have been created in the beginning; from these all the different species, as eagles, geese, hens, sparrows, &c., are believed to have been derived. Each bird, by the principle of "natural selection," chooses a companion most like itself, and thus new species are continually formed. The same would be true of plants. Among the most able advocates of this theory are De Lamarck, Geoffroy Saint-Hilaire, W. Swainson, and Charles Darwin.

Professor J. S. Henslow says:

Numerous hybrids are continually produced artificially by horticulturists, for the purpose of obtaining choice flowers and fruit, and it has been asserted that many of these are capable of fertilizing their ovules, and thus of being produced by seed. If this be really the case, it would seem to be impossible for us to draw any distinction between true species and hybrids.—Professor J. S. Henslow's Botany, p. 288.

The present classification is continually changing. To-day a variety becomes a species, and a species a genus. A stroke of the pen changes one into the other. The nectarine is classed by J. C. Loudon as a variety of the peach; by Professor De Candolle as a distinct species under another genus. Still it is known to have first grown upon a peach-tree, with other peaches. If these are distinct species, a brother and sister of the same parents might, on this principle, be called distinct species, but very closely allied. Winter wheat and spring wheat were classed by Linnæus as distinct species, but it can be proved now that they may be changed into each other. Professor J. Lindley, speaking of the citron family, says:

Those who have bestowed most pains in the investigation of Indian botany, and in whose judgment we should place the most confidence, have come to the conclusion that the citron, (*Citrus medica,*) the orange (*Citrus aurantium,*) the lemon (*Citrus limonum,*) the lime (*Citrus limetta,*) and their numerous varieties now in cultivation, are all derived from one botanical species, *Citrus medica*, indigenous to, and still found wild in, the mountains of East India.—Treasury of Botany, vol. 1, p. 291.

Many plants now in cultivation cannot be found in their wild state, and, consequently, it cannot be known by their structure what are species and what are varieties; but, if their names have not been written in books, they are all recorded in the book of nature, and can be known with great certainty by the test of sterility.

Although the present classification may be the most convenient for the study of botany in learning the structure and names of plants, yet it would seem to be very desirable to have another, made on strictly physiological principles of alliance, founded on experiment. It would doubtless be a work of time, but still of very great practical value. However, in treating the subject of hybridization, I shall call the offspring produced between two species by the name of hybrid according to the present classification, with the understanding that when it is perfectly fertile it is a classific hybrid, but not a true hybrid, or a hybrid by nature.

There is considerable diversity of opinion respecting the origin of the species, some maintaining that they are variable or transmutable, and that there is no distinct line of demarcation between species, varieties, and hybrids. On the contrary, there are others who contend that species are primary or original creations, permanent and distinct from one another. Most of our distinguished naturalists have taken the ground that species are permanent and distinct. Mr. T. A. Knight, whose judgment was exceedingly accurate, and who is declared by Professor J. Lindley, in his recent work on gardening, to have been "the best horticultural physiologist that the world has seen," expressed his opinion in the following very decided language:

I must, therefore, continue to believe that no species capable of propagating offspring, either of plant or animal, now exists which did not come such immediately from the hand of the Creator.—Horticultural Papers, English edition, p. 253.

Professor J. Lindley, one of the best of botanical writers, says:

The species of plants, like those of animals, appear to be eternal, so far as anything mundane can deserve that name. There is not the slightest evidence to show that any species of plant has become extinct during the present order of things.—Theory and Practice of Horticulture, edition of 1855, p. 471.

Prof. L. Agassiz, who has devoted a large portion of his life to the examination of species, says:

Species are formed in nature, with all qualifications; they are God's creations. If it were possible to originate new species by the development of varieties, man might be able to enlarge both the animal and vegetable kingdom, and become a creator.

And further:

It was a great step in the progress of science when it was ascertained that species have fixed characters, and that they do not change in the course of time. But the fact, for which we are indebted to Cuvier, has acquired a still greater importance since it has been established that even the most extraordinary changes in the mode of existence, and in the conditions under which animals may be placed, have no more influence upon their essential characters than the lapse of time. Nothing furnishes the slightest argument in favor of their mutability; on the contrary, every modern investigation has only gone to confirm the results, first obtained by Cuvier, and his views that species are fixed.—Contributions to the Natural History of the United States, vol. 1, p. 53.

It would appear from these opinions, expressed by so accurate observers, that species are permanent, and were created by God in the beginning, at least in the beginning of the present order of things; also, that they were completely adapted to the condition in which they were placed, and have preserved their identity from the most remote historical period to the present time. There is every reason to suppose that they will continue their existence, and remain distinct as long as the present arrangement of nature exists; and when a new order of things shall be instituted, if we may judge by the past geological history of the earth, they will be re-adapted, or new ones created, or both, not by progressive development, but suddenly and perfectly adapted to their new condition.* Professor L. Agassiz says:

Geology shows that at different periods there have existed different species; but no transition from those of a preceding into those of a following epoch has ever been noticed anywhere.—Contributions to the Natural History, &c., vol. 1, p. 53.

It is evident, then, that it was the design of the Creator to keep the various species of the present creation distinct, and not to permit any variations to occur which would interfere with His laws, or produce any new beings not in agreement with the great plan.

If we carefully examine the laws of generation in the vegetable as well as in the animal kingdom, we shall find that the different species are confined to certain limits of reproduction over which they cannot pass without reproof. Each is confined by a law of nature to itself or its varieties; and, if at any time it transcends these boundaries, the offspring is imperfect, and ultimately suffers death or total extinction. It sometimes perishes in the first generation, but it may continue to propagate itself for a few generations, and then become extinct. Such an offspring is called a hybrid. It differs from a species, because its fertility is limited. It differs also from a variety, not only in consequence of the limitation of its fertility, but also because it is the product of two species, and a variety is the offspring of one or the same species. A hybrid, therefore, is not a species, and it is not a variety. It is a hybrid only, and should be called by that name. Like the line of the parabola, it may approximate very near to a species, but it cannot become such while it retains its hybridity; for, when it coalesces with its species, it becomes permanently fertile, and is no longer a hybrid, but a variety.

The word hybrid (from the Greek word *hubris*) in its original meaning signifies insult, debauchery, a rape, prostitution; thus showing that it is the offspring of an illicit intercourse between plants of different species, and it is well known that plants which are really specifically distinct will not hybridize, unless from impotency or absence of the male plant of the same species, or in consequence of being forced by the interference of man. It is contrary to the laws of reproduction, and the offspring is imperfect, and must be kept alive by man, or by some other means than by seed. Sterility, or sterility of offspring, is the line of demarca-

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* A few species of animals are supposed to have become extinct through the agency of man in recent times, but not from any want of adaptation to their condition, as the *Dinornis*, *Dodo*, *Solitaire*, &c.—J. D. Dana's Manual of Geology, p. 578.

tion which separates one species from another, and is the true basis for all classification of species, which is founded in nature. It is a benevolent law, and its object is to keep the species distinct, and to prevent plants and animals from producing offsprings which would not be adapted to the present condition of things; and, if permitted to live, would, in the case of animals, be a burden to themselves, and those around them. But these illegitimate connections are sometimes, but rarely, permitted for a short time; perhaps to gratify the taste as in fruits, or to please the eye, as in flowers, or to subserve some temporary purpose, when the change would not be violent, or particularly interfere with the general arrangement of things. But the parents will receive back these abnormal offsprings, or hybrids, from their debauched condition, and restore them to good standing in the family of nature, if they will unite with them, although it may seem to be an unlawful union, but yet ultimately resulting in the good of the species.

The beauty and benevolence of this law may also be seen in its effects on varieties of the same species, both among plants and animals. In plants that have a tendency to sport and to produce abnormal development in their flowers, this disposition is immediately checked if carried too far by destroying the organs of reproduction, so that the abnormity may not be perpetuated. And in animals much inconvenience and suffering are prevented by limiting the period of fertility in order that offspring may not be produced which, in consequence of weakness in the parent occasioned by youth or old age, would not have the vigor of constitution to insure health, or might not be able to receive the supply of nourishment necessary for its vigorous growth, or the proper care which its welfare would demand.

There may appear to be some exceptions to this principle of sterility, for it is very difficult to find any rules, except mathematical, that are without exceptions; but it would, on this account, be unreasonable and vain to think, by collecting a complication of apparent exceptions, thus to set aside or annul a great and obvious law of nature.

If the foregoing principles of the permanency and distinctness of species are not correct, it would be very difficult to account for the purity of the species of plants and animals which have come down to us from very remote periods; for we know from fragments of plants found in Egyptian tombs, and from engravings on monuments, that the palm and the vine are the same now as in the time of Menes, and that the beautiful narcissus blooms as sweetly as when the Latian bard sung its praises nearly two thousand years ago. Professor James D. Dana says:

> Under any scheme of development of species from species, the system of life, after a few years of progress, would have become a blended mass, the temple of nature fused over its surface and throughout its structure. The study of the past has opened to view no such result.—Dana's Manual of Geology, p. 602.

Hybrids, as we have already seen, are the offspring of two different species, and therefore partake of the nature of both parents in all their essential qualities, as foliage, form, size, hardiness, color, &c. There does not always appear, however, to be a perfect commixture of the two natures in every part of the new being, but each respectively may show itself more conspicuous in one part than in another. It is now generally believed that the characteristics of the male plant predominate in the offspring. Professor J. Lindley says:

> In the midst of many experiments conducted without exactness, from which no safe conclusion can be drawn, there are some in the hands of such men as the late Rev. W. Herbert, which seem to justify the inference that, in general, the properties of the male parent will be most conspicuous in the hybrids.—Theory and Practice of Horticulture, edition of 1855, p. 495.

M. Germain de Saint Pierre says:

> The greater influence of the male may be taken as a tolerably safe guide in experiments on this subject. The female plant seems to furnish the teguments of the embryo, and at a later period the material for its nutrition; the male plant seems to supply the first constituent materials for the embryo.

The theory of the ovarist, who supposes that the embryo of the new plant exists in the ovary, and is quickened into life by the influence of the pollen; and that of the epigenesist, who thinks that the embryo is produced by the fluid issuing from the pollen, and uniting with the fluid exuding from the stigma, are now generally discarded; and the theory of the animalculist is adopted, that the germ or the organic framework of the living being, or embryo, is furnished by the pollen of the male plant, and conveyed to the embryo sack, and is nourished in it and developed in the ovules, which ultimately constitute the seeds of the new plant. Hence, it may be seen why the characteristics of the male plant predominate in the new offspring, and why it might also in many respects resemble the female plant by which it is nourished so long, and developed almost from nothing into perfect seeds which contain the rudiments of the new plant. Leuwenhoek, the German naturalist, embraced this opinion after the most careful and critical observations with a microscope of so great magnifying power that a spider's thread could be seen by it, the fineness of which was such that it would take four thousand of them to make one the size of a spire of hair. The correctness of this theory can also be abundantly proved from the animal kingdom.*

In hybridizing and in cross-breeding no change is produced during the first year in the fruit of the plant upon which the operation has been performed. It makes its appearance in the second year in the new plant raised from the seed of the one to which the pollen was applied. Mr. T. A. Knight says:

> I must, consequently, venture to conclude that neither the color of the seed-coats,† nor the form, taste, or flavor of fruits is ever affected by the immediate influence of the pollen of a plant of another variety or species.

M. Germain de Saint Pierre, a recent and experienced hybridist of Europe, confirms the views of Mr. T. A. Knight. He says:

> The fruit produced as a consequence of artificial fertilization does not differ, generally speaking, from the normal fruit.

Hence, we may conclude that the prejudice cannot be true which sometimes prevails, that the fruit of our orchards and gardens, which is raised from the same tree from year to year, is injured by insects in transferring pollen from the flowers of one tree to those of another. The change is effected in the seeds only, and not in the fruit.

To hybridizing and to cross-breeding, but especially to the latter, we are indebted for some of the choicest kinds of our fruit, as the grape, strawberry, &c. Some of the finest shrubs and trees that adorn our gardens and lawns, the beautiful roses, camellias, azalias, and rhododendrons that are scattered broadcast, as it were, from one end of the civilized world to the other, are the handiworks of the cunning workmen in these pleasing and useful arts. Nature, in her primitive state, rarely hybridizes. She has, as a general rule, left that for man to do under more favorable circumstances, while she takes care to preserve her original creations forever distinct.

True hybridization, or that which is founded in nature, produces weakness in the offspring in one form or another, the object of which appears to be to destroy hybrids and preserve the species pure. When the parent plants are very remotely allied, this weakness shows itself in a feeble and sickly constitution, and frequently the offspring perishes in a short time. When they are more closely related, there is sometimes more physical strength of constitution and vigor of growth than in either of the parents; but at the same time there is great impo-

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* The *mule* has the head, tail, and hoofs like an ass; the *ginnet* has the head, tail, and hoofs like a horse.—Massachusetts Agricultural Report for 1864, p. 135.—Agassiz.

† Rev. William Herbert thinks the coating of the seeds of plants is sometimes changed in color by the immediate influence of the pollen on the fertilized plant. This seems to be the case in maize, since a flower of a yellow variety fertilized by the pollen of a white variety will produce a white seed the first year.

tency in the reproductive organs, so that the nourishment which in other plants goes to form the seeds, in hybrids serves to increase their strength and size. Hence, as Kölreuter observes, hybrids frequently produce enormous development of their roots, tubers, flowers, and fruit. They also have a tendency to increase by roots, runners, and suckers; and indeed all true hybrids must be propagated by scions, cuttings, layers, suckers, or in some similar manner.

The beauty of flowers may be improved by hybridization. Single flowers are sometimes made double, because the sap, which usually goes to make the seeds, is thrown into the stamens in extra quantity, and they are thus transformed into petals, and the flower becomes double. Flowers of single colors, as red, white, purple, &c., may become variegated by hybridizing. Little practical advantage can be derived from producing true hybrids of annual plants, since they must perish at the end of the year in consequence of incapacity to produce seeds for reproduction. They may gratify the curiosity or please the eye by exhibiting forms that were never seen before, but which remain only for a short time and disappear forever. There are, comparatively speaking, but few true hybrids, and they must be cherished with great care in order that they may be preserved, even in perennial plants, for any considerable time. Most species do not produce them at all, and others only when they are on the very confines of the line of demarcation which separates them.

Classific hybrids generally possess all the qualities which characterize other plants, with the additional ones of improvement in size and quality of fruit, in hardiness, beauty of flowers and foliage, and sometimes in prolificacy.

If it is desired to improve the flavor of a fruit, we should select a species for the male plant possessing the quality which we desire to impart to the new plant, and hybridize the female plant of the other species with its pollen. From the seeds produced by this union we expect to get some plants which will resemble, according to the general law, both parents in flavor, &c.; and perhaps there might be one or two which would be nearly or quite equal to the male plant. If it is desired to produce a fruit hardy and of good flavor, we should select a species for a staminate plant which is hardy and delicious, and hybridize the more tender species with its pollen. If it is desired to increase the size, we should select a plant which produces the largest fruit for the staminate flower, and hybridize the one that produces the smaller with its pollen. These three qualities have been combined in the grape, in this country, by John Fiske Allen and Edward S. Rogers, both of Salem, Massachusetts, by hybridizing the native grape *(Vitis labrusca)* with the pollen of the foreign *(Vitis vinifera,)* or European grape.

Mr. Allen produced his hybrid, called Allen's White Hybrid, by hybridizing the Isabella *(Vitis labrusca)* with the pollen of the Golden Chasselas *(Vitis vinifera.)* This grape is hardy; the fruit is of a greenish white color, and high flavored, partaking largely of the qualities of the male parent. Mr. Rogers also hybridized the Mammoth Grape *(Vitis labrusca)* with the pollen of the Black Hamburg *(Vitis vinifera,)* and obtained several hybrids, some of which are of a red color and others black. He also hybridized the Mammoth Grape with the Golden Chasselas, and obtained some very valuable hybrids. They have the hardiness, in some degree, and the large size of the Mammoth Grape, and the flavor, to a great extent, of the foreign varieties. In these successful cases of hybridizing we obtain at once hardiness, increased size, and high flavor, approximating pretty closely to the male plants. Most of these hybrids are said to be very prolific in the production of fruit, and are justly regarded as a great advance in the amelioration of this species of our native, or wild grape.

Another very remarkable and valuable plant, supposed by many to be a classific hybrid, is the Mangel Wurzel. Professor J. Lindley supposes that it is a variety of the garden beet *(Beta vulgaris)* of this country; Dr. William Darlington, that it is a variety of the Chard beet *(Beta cicla,)* and Professor W. Buck

man regards it as a variety of the Sea beet *(Beta maritima)* of England. A writer in the New American Cyclopædia calls it a distinct species, *(Beta altissima,)* and says the place of its origin is not known. In Webster's dictionary it is called *Beta hybrida.* In foliage and color it resembles the Chard beet, and in size, form, and sweetness the garden beet. The concentric zones of red, and its remarkable size, seem to indicate hybrid origin. The garden beet and the Chard were extensively cultivated in Germany, where it was first seen, and there is good reason to suppose that it originated there, and is a classific hybrid

The number of ornamental plants, the flowers, the foliage, and the hardiness of which are improved by hybridization, is very large. The *Rhododendron Ponticum,* with its purple flowers, hybridized by the pollen of the *Rhododendron Indicum,* with its beautiful, flaming, crimson flowers, produces a hybrid which is much more beautiful than the former, and far more hardy than the latter. The common scarlet Azalea *(Azalea calendulacea,)* hybridized by the pollen of the yellow Azalea *(Azalea Pontica,)* produced flowers finely variegated with the colors of the parent plants. A new hybrid, said to be of very beautiful colors, has recently been originated in England from *Rhododendron jasminiflorum,* hybridized by the pollen of the *Rhododendron Javanicum.* It is called the Princess Royal, and has obtained high favor.

That singular class of plants called remontant* roses is produced by hybridizing the common species of roses, which bloom annually, by the pollen of the Chinese rose *(Rosa Indica,)* which blooms perpetually when cultivated in the conservatory. In consequence of this ever-blooming character which the Chinese rose imparts by hybridization, the common roses, which bloom naturally only once a year, are made to bloom several times. Thus we get the hardiness of the common rose, and in part the perpetual blooming quality of the Chinese rose. The philosophy of the change is, that after the flowers of the first blooming perish, the plant puts forth a new growth of wood and flowers, and in this manner the process is repeated throughout the season. The beautiful rose called the Giant of Battles *(Géant des Batailles)* is probably a hybrid from the Provence rose *(Rosa centifolia,)* hybridized by the pollen of the Chinese rose *(Rosa Indica.)* The Dr. Lindley, the Queen *(La Reine,)* the Triumph of Beauty *(Triomphe de Beauté,)* &c., are of this class. There are, also, very beautiful hybrids which are annual bloomers. The Letitia *(La Volupté,)* a hybrid between the Provence rose *(Rosa centifolia)* and the French rose (*Rosa Gallica,*) is of this kind; so also the Devigne and Blanchefleur. These illustrations are sufficient to show the very great practical value of the art of hybridizing; for, as we have seen, qualities can be imparted to fruits and beauty to flowers, in a few minutes, which, by the common course of cultivation, might require years, and even centuries, to acquire, and in many cases could not be reached at all.

The origin of varieties is a subject of deep interest, and, perhaps, less understood than almost any other. A species, unlike a true hybrid, will always reproduce itself from its seed, and for an indefinite period. The plants which are raised from its seeds will not, however, be exactly like the parent species, but will differ in some particulars, as form, size, color, quality of fruit, but not in its original type, or materially in its organic structure. These particular differences which have been enumerated constitute varieties, forms that are not monstrous, enduring only for a time and then disappearing, but the natural outgrowth of the seed, not produced by a direct fiat of the Creator, as the species are supposed to have been, but by an inherent energy, acting by determinate laws, modified by the conditions in which they are placed, as soil, climate, and other extraneous influences which are too latent for us to comprehend.

Varieties may, no doubt, be produced by a spontaneous influence. Among

* From the French *remonter, remontant*—to get up again, to grow again.

the countless numbers of flowers produced upon a single plant it could hardly be supposed that all would be constituted exactly alike. The growth of one might be more vigorous, or the pollen differently constituted in its elements, or more vital in its character; and all these might conspire to produce a plant differing sufficiently from the original species to constitute a variety. But it is not often that very marked varieties are produced by spontaneous action; yet some of our best fruits have occasionally been found growing wild, as it is sometimes called, in woods and hedges, as the pear called the Duchesse d'Angoulême, the Seckel, and the Bergen, but the seeds from which these trees grew had probably been influenced by previous cultivation.

Varieties may also be obtained by cultivation and selection. It is sometimes said that God created the species and man the varieties. There is no doubt that man, by means of cultivation, is a most powerful agent in the production of varieties. As the mind of man, when under powerful excitement, will make great intellectual efforts, such as it never made before, so a plant under the stimulus of high cultivation, will make an extraordinary development, often in a direction not expected, and produce a new variety which it never would have originated if it had been left alone in a wild state. The process pursued in this mode of producing varieties is to select the best fruit of any species or variety, and sow the seeds in a soil properly prepared for their most vigorous growth; then, again, selecting the best fruit from the new plants and planting the seeds, thus continuing the operation till the desired variety is obtained. Such varieties are sometimes called "seedlings," because they are raised from the seeds, without any artificial process of hybridizing or cross-breeding. This process of producing new varieties has been carried on very extensively, and with wonderful results, and it would be very difficult to assign the limits to which the improvement may be carried.

Professor Van Mons, a distinguished pomologist, of Belgium, cultivated the pear very extensively in this way, and with good success. He began by sowing the seeds of a healthy seedling pear which approximated nearest to the original species of any which he could find, without taking a wild one, supposing that by this course he could get some varieties different from any which had been seen before. In the fifth generation he obtained some excellent fruit, although he carried the process even to the seventh generation. He did not preserve every one of the multitude of plants which he raised from the seeds, till it matured fruit, but those which were feeble, or did not have the characters that he deemed essential for the production of good fruit, were destroyed; and so accurate had his observation become by long experience that, as he informs us, he could generally tell by the form of the leaf, the color of the branches, or the spreading of the top, whether the fruit would be good or not. He observed that, while the plant of the first generation was about seven years in coming into bearing, the time was diminished for each succeeding one, so that in the seventh it took only about four years. It would probably not be best for the common experimenter to begin with sowing the seeds of an uncultivated variety, as Professor Van Mons did, but to select the best, thus appropriating to himself what had been gained by cultivation, although he might not, perhaps, obtain anything so entirely distinct from existing varieties as was done in the case of Professor Van Mons. He raised more than 80,000 seedlings, 2,000 of which have meritorious qualities. I will name the following: Belle Julie, Beurré Spence, Beurré Amandé, Beurré Gens, Beurré Citron, Beurré Colmar, Beurré Kenrick, Clara, Clinton, Capucin, Charles Frederick, Limon, Walker, Wendell, &c.

In the grape we have a wonderful instance of the effect of cultivation in improving the quality of the fruit. Mr. E. W. Bull, of Concord, Massachusetts, in his very successful efforts to improve our native grapes, began by sowing the seeds of a hardy species *(Vitis labrusca)* of wild grape from which he raised

seedlings. He then sowed the seeds raised from these and obtained others, among which was the Concord, which was produced in the second generation from the wild vine. He then raised two thousand seedlings before he got any that surpassed the Concord. In the fourth generation, or grandchildren of the Concord, he obtained seedlings which were far superior to the Concord, and nearly equal to the European grape *(Vitis vinifera.)* The wild or foxy taste of the native grape had disappeared; the pulp had become soft, sweet, and sugary, and he says that it would be difficult to distinguish it by the taste from the foreign varieties, and all this was accomplished in only four generations. There seems to be no reasonable doubt that, as Mr. Bull thinks, the wild grape can, in a few generations, be made equal in quality to the European vine. We may, therefore, expect to have a grape as hardy as the wild grape, and as juicy and sweet as the Chasselas or the Black Hamburg.

We have every reason to suppose that the Persian or European vine *(Vitis vinifera)* has been brought to its present state of perfection from a wild grape; for it has been cultivated in Egypt from the remotest antiquity, and the Egyptians declare that Osiris first taught them its use. It had been cultivated in Asia 800 years before those pious leaders and shrewd statesmen, Joshua and Caleb, visited the valley of Eshcol and brought away "one cluster," so heavy that it was borne "between two upon a staff." It grows to an enormous size when under cultivation. Schulz says he supped under a grape-vine in Palestine the stem of which was a foot and a half in diameter, the height 30 feet, and its branches formed a canopy 30 feet in diameter. "The clusters," he adds, "are so large that they weigh 10 or 12 pounds, and the berries may be compared with our large plums." A gentleman from California, of undoubted veracity, informs me that he has seen a foreign vine in that State, planted a century or more ago by the Jesuit missionaries, which has a diameter even greater than this.

There are few plants more inclined to vary or sport than the grape. All the European varieties, which vary so much in color and sweetness, have been produced from the same species, and sometimes white varieties and black have grown on the same stalk.

The following are some of the varieties derived from the *Vitis labrusca:* the Adirondac, Anna, Cassady, Catawba, Concord, Christine, Crevelling, Diana, Dracut Amber, Hartford Prolific, Iona, Isabella, Israella, Ives's Seedling, Lydia, Maxatawny, Rebecca, and Union Village.

From the *Vitis cordifolia* originated the Clinton, Franklin, and Taylor's Bullet.

From the *Vitis æstivalis* we have the Alvey, Devereaux, Elsinburg, Herbemont, Lenoir, and Norton's Virginia.

Many of our useful as well as ornamental plants vary much by change of habitat and by culture. The cabbage in its wild state had scarcely any head. The beet, carrot, parsnip, and turnip had roots no larger than the common thistle, *(Cirsium arvense.)* The tubers of the potato were but little larger than the groundnut, *(Aralia trifolia,)* and the tomato bore fruit very much like the potato-ball, but now, by cultivation and selection, it has acquired a size of more than six inches in diameter. The strawberry has become many times larger than in its natural state. Professor Buckman, of England, in a few years converted, by cultivation and careful selection, the wild parsnip into new and good varieties. M. Vilmorin produced the same change in the wild carrot in a few generations. Winter wheat and spring wheat may be converted into each other. "M. Monnier sowed winter wheat in spring, and out of 100 plants four alone produced ripe seeds; these were sown and resown, and in three years plants were reared which ripened all their seed. Conversely, nearly all the plants raised from spring wheat which was sown in autumn, perished from frost; but a few were saved, and produced seeds, and in three years this spring variety was converted into a winter variety."* Running or twining beans may be

* Variation of Animals and Plants, &c., vol. 1, p. 360.—Charles Darwin.

reduced to bush beans by selecting the fruit that grows nearest the ground from year to year, and, on the contrary, their stems may be made to grow much longer by selecting pods from the top or end, and constantly planting. Cucumbers may be dwarfed in size, and almost stopped in running, by selecting seeds from those which grow near the root, and planting constantly. A farmer might very easily originate a new variety of wheat, by selecting some head which differed very much in size of kernel or length of spike, and sowing the seeds by themselves, from year to year, on well-prepared land, and "weeding out," those heads which are not like the original type, and rejecting the small seeds. The same is true of maize, peas, beans, and, indeed, of all plants that are inclined to sport or vary. Single flowers which have a tendency to sport may be converted into double flowers by long cultivation in rich soil, and sometimes by keeping the seeds for several years, till they become weakened in their power of germination, and then planting them. Every tendency in the plant to vary must be carefully watched. Rev. W. Wilson, after sowing the seeds of the *Anemone coronaria* for several years, noticed one flower that had an additional petal. He sowed the seeds of this flower, and continued to do so for a few generations, and obtained several new and beautiful varieties, with six or seven rows of petals. In this way most of our roses, pinks, larkspurs, ranunculuses, and dahlias were changed from their normal to their double form. So, also, the simple colors of the dahlia and other flowers, as white, yellow, red, purple, &c., were originated by watching the first indications in the direction of any particular color, and cherishing and developing this tendency by sowing its seeds. If this process of sowing the seeds of double flowers is carried too far, all the organs of reproduction are sometimes transformed into petals, and the law of sterility then comes in, to prevent the abnormity from being perpetuated by reproduction.

When a valuable plant of any kind has been obtained, it is very desirable to preserve it, and cause it, if possible, to produce true seeds every year, and thus prevent it from reverting to its original or common form. This process is called by gardeners "setting," and consists in planting the seeds, for several years, by themselves, and entirely unconnected with any other plants similar to it, and guarding at the same time against bees and other insects which may convey pollen to it. In this way, and by "weeding out" constantly, the plant becomes "set," and will, with proper care, reproduce itself regularly from year to year. It must be remembered, however, that no variety will reproduce itself in every particular of shade of color, or taste, or other properties; and, therefore, when we wish to perpetuate a variety exactly, it must be done in the same manner as in the case of hybrids, by scions, cuttings, suckers, layers, &c.

Varieties may also be produced by cross-breeding. We have already shown in what cross-breeding consists, how the operation is performed, and to what class of plants it is applied. It now only remains to explain its effects on the objects employed. All varieties, as has before been remarked, are perfectly fertile between one another, and it may be laid down as a general principle of universal application, except in cases where the relation is very close, that cross-breeding produces strength in the offspring, a result precisely the reverse of true hybridization, which always occasions weakness in some form. The design of this law of cross-breeding is, doubtless, to invigorate the species, and keep up the tone and type to its original or primordial standard. Mr. Charles Darwin, speaking of its effects, says:

> The evidence immediately to be given convinces me that it is a great law of nature that all organized beings profit from an occasional cross with individuals not closely related to them by blood; and that, on the other hand, long-continued, close interbreeding is injurious.—Variation of Animals and Plants, &c., vol. 2, p. 144.

This exception of close interbreeding, or cross-breeding, which signifies the same thing, is obviously a wise provision of nature to prevent varieties from becoming too fixed in their habits, and differing too much from the original species;

and, in the human race, to keep the members of families within the proper and natural limits of the marriage relation.

The offspring produced by cross-breeding, as by hybridizing, is of a character nearly intermediate between the parents, the characters of the male usually being the most prominent; but the variety which possesses the greatest strength, and is nearest the type of the original species, finally predominates. It, therefore, has an important influence in obliterating individual differences, and giving uniformity of character to varieties of the same species. By repeatedly cross-breeding the different varieties of the same species, we could ultimately arrive very nearly at the original standard or type of the species. Varieties of plants may be improved by cross-breeding; and even the same variety, when it is grown in different sections of the country for a few generations, and then the seeds are brought together and planted, will be invigorated and improved in size and quality.

Cross-breeding has one advantage, and a very important one, over cultivation in the production of varieties, in the fact that they may be produced at once, with a very great degree of certainty, by uniting two known qualities in one individual. In this way we may combine directly, and at our pleasure, the desirable qualities of two known varieties, and produce a cross-breed sometimes far superior to either when taken alone. But notwithstanding this, we must look to cultivation principally for originating the primary qualities, and to cross-breeding for blending them in beautiful and harmonious proportions. Although as yet by far the greater number of the best varieties of our fruits, and other plants, as the apple, pear, peach, melon, and turnip, were probably obtained by cultivation, yet very many of the choicest were the result of the artificial cross-breeding of these primary varieties.

Besides the advantages already named, cross-breeding improves the size and quality of the fruit of plants, their hardiness and prolificacy, and the beauty of their flowers. It has been found to be one of the most effectual means of acclimation, so that plants which could not endure the cold of the more northern climates are made perfectly hardy by this process. By it we may give to the hardy pears of the north the delicate sweetness of those of the south; to the insipid and watery grape the richness of the Black Hamburg; and to the white rose the delicate blush which the crimson imparts.

The benefits derived from this art are finely summed up in the following extract from the London Horticultural Magazine:

> To it we owe some, indeed many, of our most beautiful garden flowers, as well as the most valuable of our fruits and vegetables. "Among flowers, the most important qualities which can be impressed on the different races are greater hardiness of constitution, precocity or tardiness of flowering, the communication of odor where it is not possessed, increase in size, alterations in the forms of individual flowers, or greater prolificacy and improved arrangement, as regards their collective production. Modifications and the blending of colors, which are sometimes aimed at, seem to be the most paltry changes of any that are attempted. Among fruit and vegetables, the changes to be effected should be confined more to productiveness and quality than to appearance. Thus, the increase of size, together with improvement or modification of the sensible qualities, are the main objects to be sought, followed by such qualities of general application as greater hardiness, precocity, tardiness, or productiveness."

So important have the subjects of hybridizing and cross-breeding been regarded by the trustees of the Massachusetts Agricultural College, recently established by the munificent grant of Congress, that particular apartments have been fitted up, at great expense, especially for this object, with all the conveniences and appliances necessary to conduct the work with efficiency and success. Hundreds of persons in this country and in Europe are already at work in experimenting upon various plants by these methods, and I have no doubt their labors will be successful, and of great practical value to the agriculturists of our country.

Mr. T. A. Knight was one of the earliest experimenters in this art, and originated many very excellent varieties of fruits, vegetables, and cereal plants, some

of which at the present time are among the most valuable. Coe's Golden Drop was produced by him from the Green Gage, fertilized by the Magnum Bonum; the Black Eagle cherry, from the Bigarreau or Graffion, fertilized by the May Duke; the Elton, from the Bigarreau or Graffion, fertilized by the White Heart; and the Tillington and Moccas pears are his, though not of the best quality. He also originated varieties of peas, beans, wheat, &c. Messrs. Raynbird & Maud, of France, originated an improved variety of wheat from the Donna Maria, fertilized by the Boston Red. The ear was much larger and the straw stronger. From the Oxford Red, fertilized by the Pearl White, a much larger ear than either was obtained. Mr. Maud observed that, as a general rule in cross-breeding wheat, a strong male and a weak female produced a better plant than a weak male and a strong female. Professors Gärtner and Kolreuter produced thousands of cross-breeds; and also the Dean of Manchester, Dean Herbert, and more recently M. Godron, of France. It is very extensively carried on in France and Germany, and many varieties of apples and pears have been originated which are among the best known. The number of flowers that have been improved in this way in hardiness and color is immense. Most of the dahlias, the primary colors of which have been so agreeably blended in their variegated flowers, owe their beauty to this art. Many of the fuchsias, chrysanthemums, and balsams, originated in this way.

It may be well to remark here that it cannot generally be known with certainty, when a new variety first begins to bear, whether the fruit will be of good quality or not. It usually takes several years for it to develop itself perfectly. If there should be any doubt at any time whether a plant is a hybrid or a cross-breed, it may generally be known by observing the following particulars: If it is intermediate between its parents and does not produce seeds, or produces such as will reproduce it only for a few generations, it is probably a true hybrid; but, on the contrary, if it is intermediate, and its seeds are perfect, and produce vigorous offspring continually, it is a classific hybrid or a cross-breed.

The process of cross-breeding plants, although recent in its origin as artificially practiced, is of very ancient date as carried on in the wide domain of the vegetable kingdom. It commenced probably with the offspring of the first plant created by Omnipotent Power. Nature is continually carrying it on in the field, the orchard, and the garden. The pollen is passing from the flower of one variety to that of another of the same species; thus fertilizing countless numbers, he seeds of which will develop forms and fruits unknown before. Hence a vast number of the new varieties of flowers and plants which are commonly supposed to be the result of some great and powerful effort of nature, may have been produced by this process of nature's cross-breeding. The Baldwin apple has a strong resemblance in form, color, and flavor to the Esopus Spitzenburgh, and it may perhaps be a seedling raised from a seed of some other apple fertilized by its pollen. It is not probably the result of accidental growth from an ordinary seed, unaffected by cultivation or cross-breeding.

In the foregoing observations we have seen in what hybridizing and cross-breeding consist, the manner in which they are performed, the classes of plants to which they may be applied, and the beneficial results that have accrued to man from the introduction of a multitude of new plants into the vegetable kingdom; and yet it is sometimes more desirable to the practical agriculturist to know how to anticipate and avoid these intermixtures than to produce them. It becomes necessary, therefore, when we are about to cultivate different plants in the vicinity of one another, to ascertain how nearly they are allied, or to what class or classes they belong. If they belong to species of different genera we may expect no trouble from any intermixture which they may occasion. The pea *(Pisum sativum)* and the bean *(Phaseolus vulgaris,)* the peach *(Amygdalus Persica)* and the apple *(Pyrus malus,)* the common potato *(Solanum tuberosum)* and the sweet potato *(Convolvulus batatas,)* the beet *(Beta vulgaris)* and the turnip,

(Brassica campestris,) the parsnip *(Pastinaca sativa)* and the carrot *(Daucus carota,)* will never intermix with each other under any circumstances, however much they may seem, in some respects, to be similar; for they are, as may be seen, species of different and remote genera, and nature has declared that they shall never unite. They may be cultivated in the closest proximity, but they cannot intermix; and the seeds which each produces will be its own, peculiar and distinct from every other. Therefore, the first inquiry to be made in respect to any plants under consideration is, whether they belong to different genera. If they do, they will very rarely intermix, even with the present botanical classification. We may easily know to what genus or species any plant belongs, by turning to its name in any standard botany now in use.

On this principle we are able to give a satisfactory answer to the inquiry whether one plant will turn into another; as chess *(Bromus secalinus)* into wheat *(Triticum vulgare,)* oats *(Avena sativa)* into barley *(Hordeum vulgare,)* or the reverse. In the case of the first two plants, it will be observed that they are of different species, and also belong to different genera. It has been laid down as a law of nature that species are distinct, and were created so, and therefore can never change into one another. But these species belong to different genera, and we have seen that, when species are thus remotely allied, they will very rarely even hybridize. The two plants under consideration answer to both of these conditions, and of course one cannot change into the other. But, further, the experiment has frequently been tried to turn chess into wheat by high cultivation, but has always resulted in failure; the only change which has been effected being an improved variety of chess, without any change in its nature.* In cases in which wheat is supposed to have changed into chess, there must have been some deception which escaped the observation of the cultivator. The seeds might have been carried in the manure, which was, perhaps, purchased at some neighboring stable in which chess mixed with the hay had been consumed by the horses or other animals. They may have been lying in the ground for many years, and from a greater depth of ploughing than usual have been brought up to the light and heat of the sun, and thus made to germinate, since we know that the longevity of seeds is very great. Some new fertilizer may have been applied which has penetrated deeply enough to stimulate the dormant seeds into growth, and thus cause the chess to appear, on the same principle that applying ashes to fields, where no clover had grown for several years, will cause it to spring up in large quantities. The clover seeds had been lying dormant for years in the earth, and the ashes† stimulated them into growth. In cases in which wheat was sown and chess grew in its place, the fact may be explained by supposing that the wheat perished from too much wet, or too great cold, or some other cause; and the chess, being more hardy, survived, and took its place. There must have been some fallacy of this kind; for no one who is familiar with the laws of reproduction can suppose that one of these would change into the other.

On the principle of the longevity of seeds, it may be shown why a growth of blackberry or raspberry bushes sometimes springs up on burnt lands and others, after the forest has been cut away. The seeds had been carried there by birds when the trees were standing, and had been covered up in the earth to a depth below the influence of the diurnal heat, or of the fires above them. But when these seeds received the light and heat of the sun, and, in the case of the burnt

* In the case of *Ægilops triticoides*, which M. Esprit Fabre declared he converted into wheat by cultivation, it appears that it was a true hybrid from *Ægilops ovata*, fertilized by *Triticum vulgare*, (wheat,) and that the hybridity of the *Ægilops ovata* was absorbed by the stronger parent *Triticum vulgare*, or, perhaps more properly, died out by cultivation.—Variations of Animals and Plants, &c., vol. 1, p. 377; and Gardeners' Chronicle, for 1865, p. 27.

† Old spruce-fir seed, which would scarcely germinate at two years old, produced a fine, healthy crop when three years old, having been first damped, and then mixed with newly-slacked lime.—Theory and Practice of Horticulture, edition of 1855, p. 236.

lands, the stimulus of the ashes, they began to grow, and produce a new forest of a different kind, of strong and healthy brambles, yielding abundant and delicious fruit.

Also, the reason why a pine forest is generally succeeded by oaks, may be explained partly on this principle and partly on another, viz., the plan which nature adopts to secure a rotation of crops. The seeds of the pines are carried into the oak forest by the winds and the birds which inhabit it, and, in consequence of the shade and cold they do not germinate; but when the light and heat of the sun are let in by the removal of the trees, they grow immediately. On the contrary, the squirrels carry the acorns of the oaks away into the pine forest and bury them in the soft earth, where they may get them again for food; but often they never come for them, and they germinate in the shade, which is favorable to their early growth, and increase till they arrive at a certain size, and, if the pines are not cut away, then they die out. But if the trees are removed they spring up quickly, and by their rapid increase prevent the seeds of the pines from growing in a soil already shaded by the small oaks, and exhausted by the previous growth. If the neighboring forest had been chestnut or hickory, the growth would have been one of these. Thus we may learn from nature a valuable lesson, showing the necessity of a rotation of crops.

In species of plants belonging to the same genus, there is frequently great difficulty to be encountered in preventing them from hybridizing. Although it is a general rule, previously laid down, that species of the same genus will not hybridize unless nearly allied, and that the cases in which they do are but exceptions to the general principle, yet, despite this repugnancy to hybridization, there are some which are classified as distinct species that intermix with almost equal facility as varieties of the same species, and it requires the most persistent watchfulness on the part of the agriculturist to prevent their union. As an instance of this kind we may mention the pumpkin *(Cucurbita pepo,)* and the squash *(Cucurbita melopepo,)* which are usually regarded as distinct but closely allied species. The question now arises—how can we know what species will hybridize, and what will not? It can be known only from experiments of our own or others; and it will never be safe to cultivate species of the same genus in the vicinity of one another without a previous knowledge of their relationship or alliance.

The question is sometimes asked whether these two plants will change into each other. The answer may be safely given that they will not; but they will intermix, and form a classific hybrid which will resemble both plants, but will still be different from either. Since it is a law of hybridization that the hybrid partakes of the nature of both parents, and as a general rule the characteristics of the male parent predominate over the female, it is evident that when the squash is fertilized by the pumpkin the fruit grown from the seed of the fertilized plant will resemble the pumpkin more than the squash; and, on the contrary, when the pumpkin is fertilized by the squash the offspring will resemble the squash more than the pumpkin, though neither will be changed into the other. If, however, the pumpkin is the stronger plant in its specific character, the offspring may possibly in either case resemble the pumpkin more than the squash. None of the species of the squash and the pumpkin should be cultivated near one another.

The muskmelon *(Cucumis melo)* and the watermelon *(Cucumis citrullus)* are liable to hybridize. It is said by some that the muskmelon and the cucumber *(Cucumis sativus)* will hybridize, but M. Sageret, an experienced hybridist, declares that he was unable to effect any union between them. All the species of the *Cucumis*, or melons, cucumbers, and colocynths, should not be cultivated together.

The inquiry has frequently been made whether the Bush Bean *(Phaseolus nanus)* will change into the Pole Bean, *(Phaseolus vulgaris.)* It will not. But,

if it is fertilized by the Pole Bean, a classific hybrid will be produced resembling both, and doubtless will be a climbing bean, but not the same as the male parent, or Pole Bean. The Bush Bean is regarded by many as a variety of the Pole Bean, and therefore the two readily hybridize when cultivated near each other. Care should always be taken to separate them at considerable distance; and so with all the cultivated species of the *Phaseolus*, or beans.

M. Sageret says the common cabbage (*Brassica oleracea*) will fertilize all the turnip-bearing species of the *Brassica*, as *Brassica campestris*, *Brassica rapa*, and *Brassica napus*; but none of them will fertilize the cabbage. Thus it may be seen that the cabbage will intermix with the turnip, but the turnip will not intermix with the cabbage. All the turnip-bearing species will, however, hybridize with one another. Therefore, when seeds are to be grown from the cabbage, turnip, colza, or rape, they should not be cultivated together.

The intermixture of plants takes place only by means of their flowers, and consequently no cross-breeds can be produced from cultivating the tubers of different varieties together. The different varieties of the common potato will never intermix by their tubers, and they may be planted in the same hill without the least possibility of intermixture. They will, however, intermix through their flowers, like other plants, but no effect will be produced on the tubers by this intermixture; it is only in the seeds grown in the potato ball. The size of the tubers may be considerably increased by removing the flower-buds or the flowers from the stalks; and varieties that have never fruited may frequently be made to blossom by taking away a part of the tubers, that the nourishment may be thrown into the stalks and flowers. A greater profusion of flowers may also be obtained the next year from ornamental shrubs, than otherwise would have been, by breaking off the blossoms of the present year before they go to seed.

The inquiry whether varieties of plants will degenerate or "run out," as it is sometimes termed, is one that has created much interest at different times, and is really of great practical importance to the agriculturist. There is no doubt that they will degenerate, and the degeneracy may result from various causes.

1. There is a natural tendency, which has been verified by long observation, in all plants to revert to their original species. They seem to be out of their natural sphere when brought into a high state of cultivation, and very much in the condition of the savage who has been taken from his forest home and educated in some seminary of learning. He is constantly uneasy, and when the first opportunity is presented escapes to his native haunts, and joins his old companions in their revels and vices. Therefore, great care should be taken that the largest fruit and the best ears of wheat and corn may be selected in order that the choicest seeds may be procured and sown; otherwise the plants will degenerate in time, and most if not all the excellent qualities which they possessed will be lost. Professor Lindley says: "In all cases where any importance is attached to the result, the plumpest and heaviest seeds should be selected if the greatest vigor is required in the seedling."

2. They may degenerate for want of proper culture. As culture has much to do in developing new varieties, so the neglect of it will do much to destroy them, and there is no doubt that our best fruits, if removed from our orchards and gardens to their habitats in the forests, and reproduced from their seeds for a series of years, would be no better than the original species in a wild state. The delicious Newtown Pippin or the Pearmain would be no more agreeable in flavor than the little European crab-apple (*Pyrus malus*,) from which they probably originated. Professor A. Gray says:

> The races of corn, wheat, &c., which now preserve their character unchanged, have become fixed by centuries of domestication. Even these at times manifest an unequivocal disposition to return to their aboriginal stock. Were cultivation to cease, they would all speedily disappear; the greater part, perhaps, would perish outright; the remainder would revert, in a few generations of spontaneous growth, to the form of the primitive stock.—Botanical Text Book, p. 304.

The improving hand of culture must be continually upon them, or they will lose all their good qualities and become worthless.

3. The natural cross-breeding of different varieties with those of inferior qualities is a very frequent cause of deterioration. This is often observed in gramineous, leguminous, and curcubitaceous plants, which are raised annually from their seeds. All the varieties of maize are very liable to detoriorate in this way. Those of the *Sorghum saccharatum* intermix so freely that cultivators have found it almost impossible to obtain pure seeds. From the same cause it is extremely difficult to preserve any of the varieties of the melon pure for any considerable time. No one can have any security of obtaining pure seeds unless they are planted many rods from all others, and the *perfect* flowers from which seeds are to be raised are covered with small tents of gauze of sufficient size to inclose each and protect it from insects. The judicious cross-breeding, however, of individuals of the same variety, when taken from a distance, will, as has before been observed, have a tendency to improve it.

The mingling, even, of the sap of different trees, as in grafting, is sometimes not without its deleterious effects on the fruit of the engrafted scion; and the influence becomes more and more apparent the further we get from the purity of the parent stock. "It seems allowable," says Professor J. Lindley, "to infer that the goodness of cultivated fruits is deteriorated by their being uniformly worked upon stocks whose fruit is worthless.

The common apple, when grafted upon trees bearing very austere fruit, is injured by the crude and bitter sap of the tree on which it has been grafted. On the contrary, it is improved by being grafted upon a stock superior to its own. A scion, also, taken from a young tree which has never fruited, will be hastened in its growth when grafted on a mature tree, and bear sooner than it would if it had been left to itself.

4. They may degenerate from effect of climate. A vine, for instance, which produces very delicious grapes in Ohio or Missouri may become very inferior in New Hampshire or Maine. Certain fruits cannot be perfected except in certain localities where the climate is particularly adapted to their growth and congenial to their nature. There are only a few countries where the grape will grow in perfection. There is no doubt that the climate has in many instances more influence than the soil in causing degeneration of plants. We look to the sunny skies and bland atmosphere of Italy, France, Palestine, or California, for the highest development of the grape and the pear, but for the apple perhaps there is no better region in the world than New York or Massachusetts. Plants, then, should be selected that are adapted to the locality in which they are to be cultivated, or otherwise degeneracy must be expected, labor will be thrown away, and no satisfactory results can be obtained.

5. The opinion is generally entertained by agriculturists that varieties which are raised from tubers and from scions or buds become weakened or degenerated by age. This is stoutly denied by Professor J. Lindley, and as firmly maintained by Mr. T. A. Knight and others. Whatever the truth may be, the fact is obvious that varieties do degenerate by long-continued cultivation; but the change may generally be ascribed to other causes than to age. In the case of the potato the various elements of the soil that are peculiarly adapted to its growth may have been abstracted by frequent planting on the same ground, so that the plant is actually starved from year to year, and thus weakened in constitution and dwarfed in size. It is often induced, also, from selecting for seed small tubers that are imperfectly matured, and have not secreted starch in sufficient quantity to give adequate nourishment to the new plant before its roots have been sufficiently developed to enable them to draw the necessary nourishment for its support from the soil. Or, when the practice of dividing the tubers has been adopted, they may have been cut into pieces so small that they do not contain enough of the necessary elements to produce a healthy and vigorous plant. In order, then, that

there should be no deterioration, tubers should be selected of good size—some of the largest, if they are sound and well formed—and cut into two or three pieces, if that plan is preferred to planting whole, according to their size.* In this way the size, vigor, and mealy qualities would be kept up, and a good and healthy crop be secured each year.

Varieties of wheat, too, often degenerate for the same reason. A person who originates a new variety selects the ear, as we have before shown, which contains the best seeds; and he sows them from year to year, and keeps sowing and selecting them and no others, and soon he gets a variety which is much improved. But as soon as it goes into the hands of the cultivator, all the seeds, the perfect and the imperfect, are sown promiscuously and constantly, and the consequence is degeneration in a few years. Mr. Charles Darwin in "Variations of Animals and Plants," &c., volume 1, p. 379, says that "Colonel Le Couteur, in his persevering and successful attempts to raise new varieties by selection, began by choosing the largest ears, but soon found that the grains in the same ear differed so that he was compelled to select them separately, and each grain generally transmitted its own character." From this statement it is evident that the largest grains should be selected for sowing each year. This might be done at a trifling expense by sifting the grain through a sieve so prepared that the small kernels might pass through, and the large ones be retained in the sieve. Should this plan be pursued yearly there would doubtless be less complaint of the degeneration of this crop. The soil, no doubt, has very much to do with keeping up the size and vigor of the plant both in the case of the potato and the wheat. The necessary elements, such as lime, &c., which conduce to their growth, should be supplied with watchful care, and the labor would be rewarded by most ample and satisfactory results.

Too much stress, in every department of agriculture, cannot be laid on the importance of providing the proper elements for the food of plants, whateve kind may be cultivated. One person, perhaps, finds his orchard going to premature decay, while his neighbor's is thrifty and produces abundant crops. He supposes that the location of his own is more exposed to the cold winds of winter, or that by some singular fatality injurious insects infest his trees more, but the thought never occurs to him that they are starving for the food which their nature demands, when at the same time his neighbor's are well fed. It may be true that neither orchard is enriched by manure from the stable, but one is so located in a valley as to receive a good manuring yearly by the hand of nature, while the other is on an elevation from which all the elements of growth wash away. I have witnessed several instances of this kind; and probably one great reason why trees grew better in the early settlement of the country than at present is that the excellent manuring which they received from the rich, vegetable mold that had been accumulating for ages, and the heavy coating of ashes derived from the burning of the forests, were the elements most congenial to their growth, and supplied their principal food; and if the same health-giving manure could be applied now they would probably grow as well and produce as great crops as then. They must have food to live upon or they will die, more from neglect than from age. The amount of nourishment required to make the large quantity of fruit which a healthy orchard produces every year is very great, and

* The late Mr. Chancey E. Goodrich, of New York, whose knowledge of the physiological structure and habits of the potato was probably greater than that of any man in this country, or perhaps in any country, having been acquired by long experience in originating and cultivating new varieties, says, when speaking of the practice of planting potatoes whole or cut: "After practicing both methods for years, I am undecided which is best. Small potatoes and those cut very small, are certainly very objectionable in a physiological point of view." Mr. L. S. Abbott, of Ohio, says that he has made the experiment of planting alternate rows with whole potatoes and those which have been cut, and that those planted whole invariably produced the greater crop.—See Transactions of New York State Agritultural Society for 1847, p. 457.

only a small part is supplied by the air. The annual coating of leaves which enrich the forest is blown away from the orchard, and of course the equivalent must be supplied by the fostering care of man. Orchards have been saved in health for many years by proper cultivation and manuring, and others can be preserved by a similar course of treatment.

In concluding these remarks, I would say that the field of the agriculturist is large, comprising in its area the animal, the vegetable, and the mineral kingdom. It is full of variety, and presents a multitude of objects calculated to call forth the grandest ideas, the most lofty sentiments, and the most profound reverence for the great Architect who made and controls them all. It is his duty to make himself acquainted with the great laws of nature so far as his opportunities will permit, that he may apply the forces which are placed within his grasp to his own pecuniary benefit, and get a more exalted view of creative power and wisdom, and of the real dignity of the profession which he is pursuing.

OUR INDUSTRIAL COLLEGES.

It is proposed to give in this article a summary of all available information relative to the establishment of industrial colleges under the act of Congress approved July 2, 1862. The subject has so great an interest for farmers throughout the country, and is so intimately connected with an intelligent development of our national resources, that we hasten to show what has been done to secure the advantages arising from the munificent grant of Congress. It will be observed that several of the States, which fully appreciate the value of this gift, have not as yet matured plans for establishing colleges, while the southern States, in their unsettled condition consequent upon the rebellion, have not yet been able to signify their acceptance of the act. The history of these institutions will, therefore, be continued in future reports of this Department.

On the 14th of December, 1857, Hon. Justin S. Morrill, of Vermont, chairman of the Committee on Agriculture, introduced in the House of Representatives a bill appropriating to the several States a portion of the public lands for the purpose of encouraging institutions for the advancement of agriculture and the mechanic arts. Opposition to the bill manifested itself at once, and, instead of being referred to the Committee on Agriculture, it was referred to the Committee on Public Lands. Four months afterward the chairman of that committee, Mr. Cobb, of Alabama, reported the bill adversely. Having been thus brought before the House the subject was discussed, and the bill finally passed by a small majority. In the winter of 1859 it was reached in the Senate, and was strongly advocated by Senators Wade, Harlan, and Stuart, and as strongly opposed by Senators Davis, Mason, and Pugh. It subsequently passed by a majority of two, and went to the President, but was soon returned with a veto by Mr. Buchanan.

In 1862 the same bill was introduced in the Senate by Mr. Wade, was reported favorably by Mr. Harlan, and passed on the 10th of June by a vote of 32 to 7. The bill then went to the House, and on the 17th of June it passed by the decisive vote of 90 to 25, and on the 2d day of July became a law by the approval of President Lincoln.

The purpose of the donation is thus stated by the originator of the bill:

> The bill proposes to establish at least one college in every State upon a sure and perpetual foundation, acceptable to all, but especially to the sons of toil, where all the needful sciences for the practical avocations of life shall be taught; where neither the higher graces of classical studies nor that military drill our country now so highly appreciates will be ignored, and where agriculture, the foundation of all present and future prosperity, may look for troops

of earnest friends, studying its familiar and recondite economies, and at last elevating it to that higher level where it may fearlessly invoke comparison with the most advanced standards of the world. The bill fixes the leading objects, but, properly as I think, leaves to the States considerable latitude in carrying out the practical details.

The following analysis of the act presents its important features:

I. Every State may receive a quantity of public land equal to 30,000 acres for each of its senators and representatives in Congress, under the census of 1860.

II. No State is permitted to locate its scrip within the limits of another State, although its assignees may do so: *Provided*, That not more than 1,000,000 acres shall be located by such assignees in any one of the States.

III. All expenses of location, management, taxation, &c., must be paid from the State treasuries, that the entire proceeds of the sale of the lands may forever remain undiminished.

IV. The proceeds are to be invested in safe stocks, yielding not less than five per cent. per annum, and the interest "shall be invariably appropriated by each State which may take and claim the benefit of this act, to the endowment, support, and maintenance of at least one college where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the legislatures of the States may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life.

V. The grant is made on the following conditions: 1. Each State shall guarantee the entire capital of the fund it receives; that is, if any portion of the fund, by any contingency, shall be lost, it shall be replaced by the State to which it belongs. One-tenth, however, of the capital may be devoted to the purchase of lands for a site for an experimental farm. 2. No part of the fund, nor the interest thereon, shall be applied directly or indirectly, under any pretence whatever, for the purchase, erection, or repairs of buildings. 3. Any State receiving the grant must provide an institution within five years from the date of filing its acceptance of the act with the Commissioner of the General Land Office. 4. An annual report shall be made and distributed. 5. If lands improved by railroads are selected, the number of acres will be diminished. 6. No State, while in a condition of rebellion or insurrection against the government of the United States, shall be entitled to the benefit of this act. 7. No state may receive the grant unless its legislature formally accepts it within two years of its approval by the President.

The following table shows the number of acres to which each State is entitled [provided Congress removes the disability of States that have not complied with the provisions of the bill] under this act, and other general facts relative to the acceptance of the grant by the State legislatures and the location of colleges, so far as they have been established:

[illegible]	No. of Senators and Reps.	Acres in scrip.	Date of acceptance.	Date of establishment.	Designation and location.
Alabama	8	240,000	....	....	
Arkansas	5	150,000	....	....	
California	5	150,000	Mar. 31, 1866	Mar. 31, 1866	Agricultural, Mining, and Mechanic Arts College.
Connecticut	6	180,000	June 24, 1863	June 24, 1863	Sheffield Scientific School of Yale College, New Haven.
Delaware	3	90,000	Feb. 17, 1867	Mar. 14, 1867	Delaware State College, Newark.
Florida	3	90,000	....	....	
Georgia	9	270,000	....	....	
Illinois	16	480,000	Jan. 25, 1867	Feb. 28, 1867	Illinois Industrial Univer'y, Urbana, Champaign county.
Indiana	13	390,000	Mar. 6, 1865	....	Indiana Agricultural College.
Iowa	8	240,000	Sept. 11, 1862	Mar. 29, 1866	State Agricult'l College and Farm, Ames, Story county.
Kansas	3	90,000	Feb. 8, 1863	Feb. 16, 1863	State Agricult'l College, Manhattan.
Kentucky	11	330,000	Jan. 27, 1863	Feb. 22, 1865	Agricultural and Mechanical College, (Kentucky University,) Lexington.
Louisiana	7	210,000	....	....	
Maine	7	210,000	Mar. 25, 1863	Feb. 25, 1865 ———, 1856	State College of Agricultural and Mechanic Arts, Orono.
Maryland	7	210,000	Jan. 24, 1864	....	State Agric'l College, Hyattsville.
Massachusetts	12	360,000	———, 1863	Apr. 10, 1861 Apr. 29, 1863	Mass. Instit'e of Technology, Boston. Massachusetts Agricultural College Amherst.
Michigan	8	240,000	Feb. 25, 1863	Mar. 18, 1863	State Agricultural College, Lansing.
Minnesota	4	120,000	Mar. 2, 1865	Jan., 1868	Agricultural College of Minnesota, with State University, St. Paul.

Number of acres to which each State is entitled, &c.—Continued.

States.	No. of Senators and Reps.	Acres in scrip.	Date of acceptance.	Date of establishment.	Description and location.
Mississippi	7	210,000	....	....	
Missouri	11	330,000	....	....	
Nebraska	3	90,000	....	....	
Nevada	3	90,000	Mar. 9, 1865	....	
New Hampshire	5	150,000	July 9, 1863	July 9, 1866	N. Hampshire College of Agriculture, (Dartmouth College,) Hanover.
New Jersey	7	210,000	Mar. 21, 1863	Apr. 4, 1864	Rutgers' Scientific School and Rutgers' College, New Brunswick.
New York	33	990,000	May 14, 1863	Apr. 27, 1865	Cornell University, Ithaca.
North Carolina	9	270,000	....	....	
Ohio	21	630,000	Apr. 13, 1865	....	
Oregon	3	90,000	Oct. 9, 1862	....	
Pennsylvania	26	780,000	May 1, 1863	April 13, 1854	Agricultural College of Pennsylvania, Centre county.
Rhode Island	4	120,000	Jan. 23, 1863	....	Scientific School of Brown University, Providence.
South Carolina	6	180,000	....	....	
Tennessee	10	300,000	....	....	
Texas	6	180,000	....	....	
Vermont	5	150,000	Nov. 11, 1863	Nov. 22, 1864	University of Vermont and State Agricultural College, Burlington.
Virginia	10	300,000	....	....	
West Virginia	5	150,000	Oct. 3, 1863	Feb. 7, 1867	Agricultural College of West Virginia, Morgantown.
Wisconsin	8	240,000	Apr. 2, 1862	Apr. 12, 1866	University of Wisconsin, (College of Arts,) Madison.
Total	317	9,510,000			

A digest of all accessible information relative to those States that have accepted the grant is here presented, as follows:

CALIFORNIA.

1. In March, 1866, the legislature passed an act establishing a college under the name and style of "The Agricultural, Mining, and Mechanical Arts College." The design of the college is to give "thorough instruction in agriculture, mining, and the natural sciences connected therewith." To effect this object most completely, "the institution shall combine physical with intellectual education, and shall be a high seminary of learning in which the graduate of the common schools can commence, pursue, and finish a course of study, terminating in theoretic and practical instruction in those sciences which bear directly upon agriculture, mining, and the mechanical arts." The act provides for the purchase of a farm of not "less than one hundred and sixty acres" of land.

2. In addition to the congressional grant, the legislature gives to the college "all interest accruing from the sale of 15,000 acres of land, granted to this State by Congress, in 1863, and the interest that has accrued, and that may accrue, from the sale of 72 sections of land donated to the State for a seminary of learning, and all money arising from the sale of the 10 sections granted to this State for the use of public buildings."

3. The site of the college is not determined. The trustees of Oakland College, across the bay from San Francisco, have offered a site, and have further proposed to surrender their own charter, and to merge their institution in the proposed agricultural college, provided that the State shall found the University of California there, and bestow upon it all the grants which have been made for higher education in California. The proposition is to modify the plan proposed at first, and to unite in one institution the classical culture of the college with the practical instruction which relates to agriculture, mining, and the mechanic arts. The advantages of the location, arising from its vicinity to the most populous city on the Pacific coast, from its central position, and from its equable and healthy climate, are urged as reasons for accepting the proposition of the trustees.

CONNECTICUT.

1. The proceeds of the lands, which were sold for 75 cents per acre, amounting to $135,000, were appropriated by the legislature of this State to that branch of Yale College known as the Sheffield Scientific School, located in the city of New Haven. One-half the interest of the fund is to be applied to giving instruction gratuitously to students who shall be selected by an appointing board, preference being given to those who are made orphans through the death of a parent in the military or naval service of the United States; and, next to them, to such as are most in need of pecuniary aid. The appointments are to be distributed among the several counties in proportion to their population. Provision is thus made for 43 free scholarships.

2. This school was established in 1846, and in 1860 was liberally endowed by Joseph R. Sheffield, of New Haven, by donations amounting in all to $160,000. Adding to this sum the congressional grant, the endowment becomes a generous one, especially when we remember that the school is a branch of a venerable and well-endowed college, which offers to the students of this school the use of its libraries, and access to its lecture-rooms. But the school has itself a large collection of books, maps, apparatus, and specimens in natural history. No effort has been made to secure a farm for practical instruction in agriculture, and no requirement of manual labor of the students is proposed. The charge for tuition is $125 per annum. Special students in chemistry are charged $75 additional, to meet the expense of chemicals and apparatus.

3. The regular course of study occupies three years. The studies of the first year are designed to lay a foundation for scholastic discipline. During the second and third years the students group themselves into sections, according to their tastes and plans for future life.

4. A partial course of instruction is given in agriculture, occupying seven months in winter, arranged for the convenience of those who cannot pursue a longer course of study. Special students, desirous to become proficient in some branch of chemistry, are also received into the laboratory. Students likewise receive special instruction in natural history and in practical astronomy. In the study of the latter, the institution possesses rare instruments and appliances, and affords facilities for instruction which are seldom surpassed, if equalled, in this country.

DELAWARE.

1. In March, 1867, the legislature passed an act for "establishing a college for agricultural and mechanic arts." The act provided for the acceptance of a proposition made by the trustees of Delaware College, located at Newark, by which a joint interest in the grounds, buildings, and other property of the college shall be conveyed to the State for the purposes specified in the act establishing agricultural colleges, on condition that the State shall vest the income arising from its congressional grant in a board of trustees, one-half of whom shall be the representatives of the State, and the remainder the representatives of the present board.

2. The trustees are required to "establish and maintain such a course or courses of instruction in said college as shall carry out the intent of Congress, and shall provide for the gratuitous instruction of one pupil from each 'hundred' in the State."

ILLINOIS.

1. This State claims to have been the first to make a combined and persistent effort for the appropriation of national lands to encourage industrial education. In 1851 a convention was held in the State to consider such means as might be

deemed most expedient to further the interests of the agricultural community, and to take steps toward the establishment of an agricultural college. In the year following, another convention was held for the same purpose, and a resolution was adopted to petition Congress to appropriate public lands for each State in the Union, for the endowment of colleges for the education of the industrial classes in their several pursuits. At a subsequent session, in 1853, the convention adopted a memorial to Congress, asking for a grant of lands, not less in value than $500,000, "for the endowment of industrial universities in each State," for the dissemination of knowledge needful in those pursuits, and developing to the fullest extent the resources of our soil and our arts, and the true glory of our country.

2. Strong efforts were made, by parties acting in the interest of certain existing institutions, to secure the appropriation of the congressional grant to local purposes; but the legislature wisely refused to unite the proposed college with any other. The citizens of Champaign county having offered donations in land, buildings, and bonds, of the value of $400,000, the legislature decided to establish the college there on the domain thus donated, including ornamental grounds, experimental and model farms and gardens, of more than 1,000 acres.

3. The aims of the institution are, "to produce scholars of sound learning, men of Christian culture, trained to affairs, and to be leaders, if need be, in those mighty industrial interests on which the social well-being and civilization of our country depend." The trustees have established a literary and scientific course, similar to that pursued in the older colleges of the country; a department of mechanical science and engineering; one of analytical and applied chemistry; one of natural history and practical geology; a commercial department, "designed to fit students to become practical accountants and successful agents of commercial enterprises;" and a department of agriculture. We copy a full list of studies of the latter:

FIRST YEAR.

The farm.—Its measurements and mapping; subdivisions: meadows, pastures, orchards, wood lands, gardens, &c. Fences, hedges, farm buildings. Soils; classification and mechanical treatment of soils, ploughing, &c. Drainage. *Plant culture.*—Structure and physiology of plants; classes of the useful plants, their characteristics, varieties, habits, and values. Wheat culture, maize culture, grass culture, root culture, fruit culture begun, apples, pears, peaches, &c.

Collateral studies.—English language and composition, surveying, drawing, botany, French language and literature.

SECOND YEAR.

The farm.—Chemical elements and chemical treatment of soils. Fertilizers: their composition, manufacture, preservation, and application. Climate: influence of light, heat, and electricity on soils and vegetable growth. Farm implements: principles of structure and use. Road making.

Fruit culture.—Modes of propagation, production of new varieties, diseases of fruit trees. Insects injurious to vegetation.

Animal husbandry.—Breeds and varieties of neat cattle, horses, sheep, and swine. Principles of breeding, rearing, training, fattening, &c. Chemical composition of food, and preparation of the several varieties. Sheep husbandry; poultry; bees.

Collateral studies.—Mechanics, chemistry, zoology, entomology, mineralogy, German language and literature.

THIRD YEAR.

Agricultural economy.—Relation of agriculture to the other industries and to commerce. The several branches of agriculture. Agricultural bookkeeping, the farm book, herd book, &c. Rural law: of tenures and conveyances of land, of highways, of cattle, of fences, of noxious weeds, &c. Veterinary surgery and medicine. Landscape gardening, and laying out of large farming estates. Rural architecture and engineering, foreign agriculture, history and literature of agriculture.

Collateral studies.—Geology, meteorology, physical geography, inductive logic, political economy, history and civil polity, English literature.

4. All students, unless excused on account of physical inability, will be required to labor on the farm or garden, from two to three hours daily, for which compensation will be made.

5. The trustees have already issued a circular to correspondents, asking for information relative to the industrial resources of each portion of the State, the extent to which they are developed, and the methods and processes of labor and machinery most approved. These inquiries relate to the mineral productions, such as ores, stone, coal, potter's clay, sand for the manufacture of glass, the production of salt, &c.; to vegetable productions, other than from agriculture, such as lumber and its manufacture; to *mineral manufactures*, such as working in metals, stone, clay, sands, &c.; to the working in grains; manufacture of sugar, flax, paper; to the packing of pork; in short, to the various forms of industry in which the citizens of the State are employed. Five thousand copies of the report of the trustees, embodying these facts, are to be printed, and distributed in the State.

INDIANA.

This State accepted the congressional grant on the 6th of March, 1865, but the act of the legislature foreshadows no plan for establishing the college, nor has any information been received in relation to it.

IOWA.

1. As early as 1858 the legislature of this State appropriated $10,000 for the purchase of land for a model farm and an Agricultural College. The county of Story also gave $10,000, and individuals $7,000, for the same purpose. The legislature afterward made an additional grant of five sections of land, originally given by Congress for the erection of a capitol, from which the college has realized $14,000. The lands allotted to this State by the congressional grant have been located within the State, and are valued at $480,000. They were carefully and judiciously located by a gentleman appointed for that purpose, who made the selection after a personal examination. These lands are now leased for 10 years to settlers, who pay annually in advance 8 per cent. interest on their estimated value, with the privilege of purchasing the same on the expiration of the lease. Under this excellent arrangement the college already realizes an annual income of $30,000.

An earnest effort was made to divert these lands from the Agricultural College, and to use them to increase the endowment of the State University, upon the condition that a department of agriculture should be established, an experimental farm be purchased, and an agricultural course in the university be provided for such as wished to pursue it. It was urged, as it has been elsewhere, that by adopting this course there would be a large saving in the expense of buildings, professors, cabinets, librarians, &c., and that in no other way could desirable and necessary funds for the university be so easily procured. The friends of the Agricultural College resisted this attempt to divert the grant from its original purpose, contending that it belonged to it from the terms of the act of Congress; that the industrial classes comprised the majority of the people and tax-payers of the State, and they desired to build up an institution that should be devoted to their interests. After an able and earnest discussion of the subject the entire grant was given forever to the Agricultural College. From the judicious location of the lands they constitute a fine additional endowment of an institution in which the people of the State have a great interest.

2. The college is located in Story county on a farm of 640 acres, for which the legislative appropriation of $10,000 was paid. Appropriations were made in 1864 and 1866 to the amount of $111,000 for the erection of buildings designed to accommodate 200 students with board, lodging, lecture rooms and class rooms.

3. Tuition in the college will be forever free to pupils from this State. The course of study is not yet determined, but is designed to embrace the natural sciences, and such mechanical arts as are directly connected with agriculture. It is intended to combine labor with study, and to show the practical application in the field and in the laboratory of the principles taught in the class room. The hours for labor are to be two daily in winter, and three in summer, for which compensation will be made to the students.

KANSAS.

1. This State early accepted the national grant, and established a State Agricultural College in February, 1863. The lands which fell to its share amounted to 90,000 acres, and were judiciously located within the boundaries of the State by a commission who personally visited and inspected each quarter section. They are held at prices ranging from $3 to $8 per acre, and it is expected that $500,000 will be realized from the sale. In the mean time, without waiting till the fund shall be raised, the legislature advances the sum necessary to defray the current expenses of the college.

2. The college is located near Manhattan, about 115 miles west of Leavenworth. It is easy of access by railroad, and the dêpot of the Union Pacific railroad is within two miles of the institution. The Kansas valley, in which Manhattan is situated, is one of great beauty and fertility.

3. There are two courses of study in the college. The academic, or classical, is modelled after that of the most approved colleges in the older States. The agricultural and scientific course is intended for a three years' course, and seems well adapted to the education of the class of pupils for whom it is intended. It embraces a thorough study of soils, drainage, tillage, and fertilizers; the study of botany, structure of buildings, breeds of domestic animals, culture of fruit and forest trees, horticulture, and the culture of grapes; insects injurious to vegetation, economical conditions of farming arising from the adaptation of soil and climate, together with surveying and engineering, and field instruction in botany and geology.

4. The institution is designed to promote a more thorough preparation of teachers for the work in which they engage. Already 60 teachers have gone out from it to influence hundreds, perhaps thousands, and to impart to them, indirectly, the benefits which will surely flow from the munificent grant of Congress.

KENTUCKY.

1. The legislature of this State accepted the grant on the 27th of January, 1863. The portion of land allotted to her amounted to 330,000 acres, and it was at first expected that it could be sold at $1 per acre. The continuance of the war, however, and the unsettled condition of this portion of the country, prevented its sale, and ultimately not quite half that sum was realized. The scrip sold for $164,960, and is invested in Kentucky State bonds, bearing interest at six per cent. per annum.

2. For two years after the acceptance of the grant, nothing was done toward establishing the college. There was no lack of interest in it on the part of the legislature or the people, but the State was to some extent the theatre of war, and the people were struggling under the burdens of taxation. At length a proposition was made to Mr. John B. Bowman to establish the college as a part of the Kentucky University. This gentleman, while pursuing the occupation of a farmer, moved by a desire to diffuse the blessings of a thorough education among the industrial classes, conceived the plan of founding for the people of his native State "a modern American University," especially accessible to poor young men. By his efforts a fund of $200,000 was raised, a large portion of

which sum was contributed by farmers of central Kentucky. In February, 1858, a charter was procured, and in the following year the college was opened at Harrodsburg. In 1865 overtures were made to transfer to his institution the property of Transylvania University, and to unite with these two foundations a third, derived from the congressional grant. A bill authorizing this disposal of the grant passed the legislature by a large majority. Mr. Bowman immediately proceeded to raise a fund of $100,000 for the purchase of a farm and for the erection of buildings; and in three months he secured the sum, 65 of the citizens of Lexington having given $1,000 each, and it was afterward increased to $100,000. Mr. Bowman soon after purchased, for the permanent site of the united institutions, Ashland, the homestead of Henry Clay, and Woodland, an adjoining estate, which lies within the limits of the city. The entire tract contains 433 acres of land of much beauty and fertility. The successful accomplishment of this enterprise is in the highest degree creditable to Mr. Bowman and to his enlightened fellow-citizens who co-operated with him.

About one-third of the estate purchased is a beautiful blue-grass woodland, with a heavy growth of trees upon it of every variety indigenous to central Kentucky. The remaining portion is divided into fields, gardens, orchards, nurseries, and ornamental grounds, handsomely laid out—the work of more than 50 years pursued by the illustrious statesman whose home it was. It is the intention of Mr. Bowman, the regent of the university, to improve still further the grounds, and, with gardens and greenhouses and highly cultivated fields, to make the estate a model for the practical instruction of the pupils of the college. Labor and study are combined. The entire labor on the estate is performed by the students, under the direction of a skilful farmer, a horticulturist, and a mechanic. There are on the estate the present season 90 acres of wheat, 50 acres of oats, 50 acres of corn, 15 acres of hemp, and a herd of 75 fine Durham cattle are fattening on its rich pastures.

3. The legislature has clearly defined the character of the Agricultural College, which now forms a part of the university. It enacted that there should be established "a competent number of professorships for teaching the sciences related to agriculture and the mechanical arts, including military tactics; and, as a part of said college, there shall be conducted an experimental or model farm, where agriculture may be practically learned, and the student, if he chooses, may earn his support while being educated, in whole or in part, by his labor and industry." It is not to be in antagonism to other portions of the university, nor is it intended to undervalue a regular course of classical study, but is designed to meet the wants of the masses, who have neither the time nor the means to give to a classical course. It proposes to dignify labor, and to give to young men practical views of life, as well as an experimental knowledge of the useful and honorable pursuit of agriculture.

4. The course of study embraces a wide range of instruction in the English language and literature, mathematics, history, natural science, philosophy, civil engineering and mining, and modern languages. The students also have access to the libraries of the university, which contain 15,000 volumes, and to the lectures in various departments of science, which are illustrated by ample apparatus; also to any course of instruction in any department of the institution.

5. Three hundred State students may be received without charge for tuition; all others pay $30 annually.

6. It is creditable to Kentucky that within the last twelve years, and for the most part in the very midst of the convulsions of the war, the sum of $700,000 has been secured as its endowment; four of its colleges have been organized, with a corps of 30 professors; and 650 students, from 25 States, are receiving instruction. This number includes the members of the Agricultural College.

MAINE.

This State received 210,000 acres in scrip, the greater part of which was sold for a little more than 53 cents per acre, 17,300 acres remaining unsold. The legislature, on the 25th of February, 1865, established the "State College of Agriculture and the Mechanic Arts," and elected a board of trustees, leaving to them the location of the proposed institution. In January, 1866, the board fixed the location in the town of Orono, seven miles north of Bangor, easy of access and centrally located, on a farm containing 375 acres of land, given by the town for this purpose. Further donations have been made by the State of $30,000, and individuals in the city of Bangor have given $15,000. The location is one of great natural beauty, the soil of an excellent quality, with a diversity sufficient for the various purposes of an agricultural school. A house has been erected for the superintendent of the farm, and a building for a dormitory for the use of students. Preparation has also been made for the erection of other buildings, and plans for organizing the college are in progress.

MARYLAND.

1. The subject of establishing an Agricultural College in this State engaged the attention of its leading citizens many years before the congressional bill became a law. At first it was proposed to establish courses of agricultural education in the public academies and schools. Various propositions were, from time to time, urged upon the attention of the public, all tending to develop a sentiment in favor of a professional education for the "future farmers of the State." In 1856 a charter was procured for a college, and subscriptions were made by which a farm, now consisting of 283 acres, was purchased, and a college building erected, with a total investment, for land and buildings, of $100,000.
The college was opened for students in 1859, and 65 students resorted to it for instruction. At the commencement of the war in 1861 the number was reduced to 17, and great embarrassment in the financial condition of the college was felt. Nor were these difficulties removed by the reopening of the college when the war ended. The legislature now came to its aid, and paid off all its indebtedness, amounting to $45,000, and assigned to its use the congressional grant. Ten per cent. of the proceeds of the sale of the lands was reserved by the State, to be paid into its treasury to reimburse the State in part for the advances made to the college. The remainder, amounting to $101,253, was invested in State stocks paying six per cent. interest, and yields $6,075, payable semi-annually.

2. The farm and buildings are located at Hyattsville, nine miles from Washington, on the Baltimore and Washington railroad. The building is not completed, but the present structure contains six spacious lecture rooms, 51 chambers, a chapel, a laboratory, and large accommodations for domestic uses. There is also a residence for a professor, with 27 rooms for students.

3. The scientific course of instruction is adapted more particularly to agriculture than to the mechanic arts. Among the studies pursued are chemistry, natural philosophy, mineralogy and geology, botany, including vegetable physiology, entomology, and the analysis of soils and manures. Manual labor has been a feature in the college discipline from the first, and it is claimed that it has worked well. In connection with it, daily lessons of instruction are given in the field. Most of the professors eat at the same table and lodge in the same house with the students. They are thus brought into close and friendly contact with them, and exercise a wholesome influence upon their moral and intellectual growth.

4. Provision is made by the State for 60 free scholarships, open only to citizens of Maryland. The charge to all others is $75 per annum for tuition, and the cost of board is $22 50 per month.

MASSACHUSETTS.

1. The portion of lands allotted to this State was 360,000 acres. The legislature accepted the grant at an early period, and Governor Andrew strongly urged, in his message in January, 1863, the propriety of bestowing the grant upon Harvard University, or, rather, upon those noble institutions of science which are connected with the university. His argument was, that by combining and concentrating endowments, a waste of means and a weakening of resources are prevented. At Cambridge and Boston, there are already professors in the various departments of science of the highest celebrity, and ample means of instruction and illustration in large libraries and costly apparatus. After much discussion in the legislature, this plan was rejected, but one-third of the avails of the sale of the lands, after deducting one-tenth set apart for the purchase of a farm, was given to the Institute of Technology, in Boston, and two-thirds to an Agricultural College, the location of which was to be determined by the trustees. A proviso in the act required that a further sum of $75,000 should be raised by voluntary subscription for the erection of buildings.

2. The Institute of Technology is a purely scientific school. It has an ample endowment, one of the most spacious and elegant buildings in Boston, able instructors, and numbers 170 pupils. Its object is to provide a full course of scientific studies for students who seek to qualify themselves for the professions of the mechanical and civil engineer, practical chemist, engineer of mines, and builder and architect, while at the same time a general education is furnished, founded on the mathematical, physical and natural sciences, English and other modern languages, and mental and political science.

3. The town of Amherst having pledged the sum of $75,000 for such buildings as were necessary to put the college in operation, and an eligible site and a farm of 383 acres having been secured in that town, at a cost of $41,000, the Agricultural College of the State was located there, and the buildings were so far completed that it was opened for students in the fall of 1867. A building 50 by 100 feet, and four stories high, has been erected, containing rooms for 46 students, two recitation rooms, a library, and two large rooms containing the State cabinet of specimens, illustrating the natural history and geology of Massachusetts. In addition to this a boarding house has been built for the use of the students; a chemical library, containing rooms for lectures, practical chemistry, and apparatus; a botanic museum, containing a lecture room; and, on the upper floor, cases for the exhibition of fruit models, specimens of seeds, woods, and other vegetable products. An elegant group of glass buildings, with curvilinear roof, has also been erected by the liberality of Dr. Durfee, of Fall River. These buildings cover 5,000 square feet of surface, and are heated by hot water. Its value for experiments in hybridizing, propagating, and cultivating useful and ornamental plants, as well as in teaching horticulture and botany, can hardly be overestimated.

4. The regular course of study extends through four years. In addition to mathematics under Professor Snell, it embraces botany and horticulture under President Clark, rhetoric, history, moral philosophy, and astronomy. Lectures are given on comparative anatomy, organic chemistry, mineralogy, cultivation of the vine and of fruit and forest trees, architecture, and English literature.

An intelligent and skilful superintendent of the farm gives daily instruction in regard to the best methods of agriculture. The students are required to labor two hours on alternate days, without pay, and for additional work they are paid at the rate of 12½ cents per hour. All the students, during the term of which we have a report, willingly consented to this arrangement. More than one-half the class voluntarily worked for wages, and the best scholar in the class earned the most money. The last report of the trustees of the college says:

A young man of good talents, who is healthy and willing to work, can here procure a superior education for $100 per annum, in addition to what he can earn on the premises.

MICHIGAN.

1. As early as the year 1855 the legislature, in pursuance of a requirement of the constitution of 1850, passed an act for the purchase of a farm, and the endowment of an agricultural school. A tract of land was procured, situated four miles east of Lansing, the capital of the State, consisting of 676 acres of heavily timbered land. The institution was in a prosperous condition at the time when the national grant was made. A college building, 50 by 100 feet, three stories high, four brick dwellings for professors, and a boarding hall 43 by 82 feet, and three stories high, had been erected. About 300 acres of the farm had been cleared and brought under cultivation.

2. The national grant of 240,000 acres was given to this institution, and the name "Agricultural College" was bestowed upon it. The lands are all located within the State, and the minimum price established by law is $2 50 per acre. In addition to this, the legislature has vested in the college about 6,000 acres of swamp land, situated in the vicinity of the farm. These lands are thought to be worth at least $30,000, and their value will increase.

3. This college proposes, 1st. To impart a knowledge of science, and its application to the arts of life. The instruction given in the class room will be illustrated by experiments in the garden and on the farm. 2d. To afford the students the privilege of daily manual labor, not merely because it is remunerative, but because it is educational, being planned for the illustration of the principles of science, and because a taste for the pursuits of agriculture can be fostered in no other way. Students who pursue a college course without labor rarely engage in industrial pursuits. They are wholly removed from sympathy with farmers, at a period of life when tastes and habits are rapidly formed. The trustees of this college act on the principle that, if a farmer is to be educated for the life and pursuit of a farmer, it must be on the farm itself. Three hours' work daily on the farm or in the garden are required of each student; and while health is preserved by manual labor, he becomes interested in every department of farm and horticultural work. 3d. The college prosecutes an extended course of experiments for the promotion of agriculture, and these are pursued continuously from year to year. 4th. The practical applications of science are pursued in directions desirable for the farmer, as surveying, levelling, laying out grounds, &c. 5th. The college has in view, during all this time, the necessity of general education and mental culture to the farmer. Mathematics, chemistry, botany, rhetoric, mental and moral philosophy, together with the correct use of the English language, occupy the attention of the students during the collegiate course.

4. Tuition is free to all students from the State. All others are charged $20 a year. Board is furnished, exclusive of room and washing, at $2 60 a week. The present number of pupils is 108.

MINNESOTA.

The general statutes, revised in 1866, established an agricultural college on a tract of land of not less than 480 acres. "Graduates, of both sexes, of the common schools may then commence, pursue and finish a course of study in those sciences and arts which bear directly upon agriculture and kindred industrial pursuits."

A full course of study shall extend through four years, and embraces "the English language and literature, animal and vegetable anatomy, physiology, the veterinary art, entomology, geology, political, rural, and household economy, horticulture, moral philosophy, history, book-keeping, and especially the application of science and the mechanic arts to agriculture."

No information has been received relative to the sale of the lands or to the organization of the college.

NEW HAMPSHIRE.

1. The share allotted to this State was 150,000 acres, and was sold for $80,000, and invested in bonds of the State of New Hampshire. The proceeds were appropriated to Dartmouth College, at Hanover, on condition that the college furnish the use of an experimental farm, the requisite buildings, libraries, and apparatus. Five trustees of the Agricultural College thus established are appointed by the governor and council, and four by Dartmouth College. Twelve students, one from each senatorial district, will receive gratuitous instruction.

2. Dartmouth was able to offer, as the basis of the national school of science, the advantages of two endowments, one by the late Abiel Chandler of $50,000, and the other by General Sylvanus Thayer of $40,000; the first for the support of a permanent school of instruction in the college, in "the practical and useful arts in life, comprised chiefly in the branches of mechanics and civil engineering, the invention and manufacture of machinery, carpentry, architecture and drawing, modern languages and English literature, and such branches of knowledge as may best qualify young persons for the duties and employments of active life." The last provides for a course of study of the highest order in architecture and civil engineering, having reference to the large demand for high attainments in these studies, which the unfolding resources of our country are sure to make.

The trustees have announced that the course will comprehend the various branches of applied science, and will extend through a term of four years.

NEW JERSEY.

1. The proceeds of the sale of the scrip for public lands were given to Rutgers College, at New Brunswick, the "interest to be devoted wholly and exclusively to the maintenance, in that department of Rutgers' College known as Rutgers' Scientific School, of such courses of instruction as shall carry out the intent of the act of Congress making the grant." This school was opened in September, 1866.

2. The studies include civil engineering and mechanics, chemistry, agriculture, botany, geology, architecture, rhetoric, mental philosophy, and history. During the three years' course, mathematics is extensively studied. In practical agriculture, special attention is given to tillage, farm implements and machinery, drainage and irrigation, manures, farm buildings, cereals and root crops, grasses, the orchard and the vineyard, and to ornamental trees and landscape gardening.

3. A farm for experimental purposes has been purchased in the vicinity of the college. The charge for tuition in the college is $75 a year. A certain number of pupils, however, from the State of New Jersey, sufficient to absorb one-half the income of the land-grant, at the rates usually charged for tuition, are to be received and instructed without charge.

Forty-three students were in attendance during the last year.

NEW YORK.

1. To the enlightened and intelligent friends of agriculture in this State is due the honor of making the earliest efforts to establish a school of agriculture. As early as 1837 Judge Buel, editor of the Cultivator, seconded by Dr. Beekman and others, urged the importance of such a school, and funds were procured, and a site selected near Albany, and a plan formed for a course of agricultural education. The project failed, but was again renewed by Dr. Beekman in 1844, and failed of success only through the death of a liberal friend of the enterprise. In 1856 the members of the State Agricultural Society revived the undertaking, and by their efforts $40,000 were appropriated by the legislature towards a college of agriculture on condition that a like sum should be raised by private sub-

scription. This sum was raised, and a farm of 400 acres was purchased in Ovid, near Seneca lake, and a building erected for the use of the institution. The funds were now all exhausted, and the school was begun with a single instructor, who, in 1861, entered one of the first regiments which New York sent to the national army, and the school was suspended.

2. Another institution for the industrial classes had in the mean time been started at Havana, under the title of the People's College. It awakened a very general interest among the people, and, with the assurances of large endowments from a single individual, of lands, workshops, machinery and apparatus suitable for a great industrial university, the legislature, in 1863, appropriated the national land scrip assigned to the State to this projected college.

3. The conditions upon which the grant was bestowed not having been complied with, the legislature was led to give the land scrip to Cornell University, an institution founded at Ithaca by Mr. Ezra Cornell. This gentleman had given $500,000 to establish this institution, and now made the additional gift of 200 acres of excellent land with buildings as a farm for the use of the agricultural department of the university. He also gave the Jewett collection in geology and palæontology, which had cost him $10,000, and added other gifts to the amount of $25,000.

The share allotted to New York was 990,000 acres. Under the judicious management of Mr. Cornell in employing an agent to visit each quarter-section before locating the scrip, it is expected that $1,000,000 will be realized from the sale.

4. The Agricultural College will be opened for students in the autumn of 1868. One hundred and twenty-eight pupils, or one from each assembly district of the State, will receive free tuition. The course of study will be adapted to the needs of pupils who are to follow industrial pursuits, and compensated labor on the farm or in the workshop will form a part of the plans of the institution. The names of the faculty and the contemplated course of study are not yet made public. It is said, however, that the university, of which this college forms a part, will begin its instructions with an able faculty, who are to be paid $40,000 per annum, with suitable accommodations. It has resources which will yield from the beginning a yearly income of $50,000.

OHIO.

The allotment to this State was 630,000 acres. On the 13th of April, 1865, the legislature accepted the grant and made provisions for the sale of the scrip. Five commissioners were appointed to examine and report to the governor as to the location of the college, and also a plan for its organization, with authority to receive proposals for the donation of lands, buildings, or money, for the use of the institution.

No report of the trustees, nor of proceedings subsequent to their appointment, has yet been received.

PENNSYLVANIA.

1. The congressional grant was appropriated by the legislature to the "Agricultural College of Pennsylvania," in Centre county. It amounted to 720,000 acres, and was sold at prices varying from 55 to 58 cents per acre. The college was an existing school, established at the earnest solicitation of the State Agricultural Society, in 1854. The executive committee of the society appropriated $10,000 for its support, and in 1857 the legislature donated $50,000 for the same purpose, on condition that a like amount should be raised by subscription. The friends of the institution were, however, disappointed in their expectations of receiving the amount of money required to complete the necessary buildings, and to provide an adequate corps of teachers.

2. In December, 1859, Evan Pugh was appointed president, and discharged the duties of professor of chemistry and scientific and practical agriculture. He was a man of great energy of character, and, having studied in the agricultural and mining schools of Germany, drew around him a large number of pupils. His death, in 1864, together with the disturbed condition of the country, diminished the number of students. In 1867 the plan was so far changed as to include, with a scientific course on agriculture, mechanical and civil engineering, metallurgy, mineralogy, and mining.

3. The institution has an experimental farm of 400 acres, on which experiments will be instituted with a view of ascertaining the best system of rotation of crops, the most suitable manures, and the best method of applying them, together with the best methods of plant culture as applied to the productions of the garden, the field, and the pleasure ground. All the students in this department are required to assist in the work, and to record the experiments in a memorandum book. They will, in connection with this, pursue the study of botany, physiology, mathematics, drawing, veterinary surgery and medicine, and the English language. Other classes will attend to mechanical and civil engineering, embracing surveying and levelling, road-making and topographical surveying, together with a full course on chemistry, metallurgy, and mining.

The expenses are $130 per annum, which will be diminished by the system of compensated labor that has been established.

RHODE ISLAND.

One hundred and twenty thousand acres were allotted to this State, and the scrip was sold for $50,000, or 41⅔ cents per acre. It was given by the legislature to Brown University, for the establishment of a scientific department, in order to promote the liberal and practical education of the industrial classes. As the scrip was sold on time, payable in five instalments, the last of which is due in August, 1870, the university has not yet received from it a sufficient income to enable it to open a scientific department.

VERMONT.

Vermont received 150,000 acres in scrip. The legislature, in accepting this gift, established an Agricultural College, and subsequently incorporated this new institution with the University of Vermont, at Burlington. Instruction will be provided in the scientific department of the college for students who wish to pursue a course of three years in analytical and agricultural chemistry, or in civil engineering, or in mining and metallurgy, and also for young men who desire to obtain such instruction as can be furnished them by a course of lectures specially adapted to the wants of agriculturists, to be given in February and March. Students of the three years' course will study the French language, the various branches of mathematics which relate to the practical uses of life, botany, including forestry, field engineering, drawing, and the English language.

The charge for tuition is $15 per term. Students in the laboratory courses incur an additional charge of $40 per annum.

WEST VIRGINIA.

The scrip allotted to this State, amounting to 150,000 acres, was sold for $90,000, and appropriated by the legislature to the endowment of an Agricultural College at Morgantown. An academy and female seminary had previously been founded at this place, both of which, together with the funds belonging to them, were tendered by the trustees to the State as a partial foundation for the new institution. These funds, including buildings and grounds, were estimated

at nearly $50,000. The avails of the scrip are invested in bonds of the State, bearing six per cent. interest. With this moderate endowment the trustees propose to maintain a preparatory department, a college proper, a scientific and an agricultural department. The college opened in September, 1867, with a president and six professors, and 138 students in the different departments.

WISCONSIN.

1. The national land grant allotted to Wisconsin amounted to 240,000 acres. It was located within the State, and is valued at $300,000. It was given to the State University, established at Madison, on the basis of a grant of lands by Congress for this purpose of 46,000 acres, from which a "University Fund" of $300,000 had been realized. The present available income of the united institutions is about $13,000.

2. It was made the duty of the board of trustees to purchase an experimental farm of not less than 200 acres, in the immediate vicinity of the University, and to make such improvements as will render it available for the purpose of experiment and instruction in connexion with an agricultural course. They were able to make such a purchase, on favorable terms, of lands contiguous to those already owned by the University, and the two now form one tract of 235 acres. The farm was purchased by Dane county, for the Agricultural College, at a cost of $40,000. It has a diversified soil, and is well adapted to the purposes of the institution. The students of the college perform much of the work upon the farm, and are paid for their labor. Five acres of this farm have been granted to the Wisconsin State Horticultural Society, which is now planting it with vines, trees and shrubs.

3. The course of study in agriculture is so arranged that one can devote his whole time to this subject for three years, if he elects to do so; or he may connect himself with the College of Letters or Arts, and devote as much time as he pleases to the agricultural studies. An able and earnest corps of instructors give promise of success to the institution.

The following course of study has been adopted:

First year.

Botany.—Including microscopic examination of tissues; the germination and growth of plants; the general principles of classification in the different departments of natural history; the limitation of species and the origin of varieties.

Practical agriculture.—Location of farm and division into fields; arrangement and planning of farm buildings; farm implements and general principles of tillage; principles of drainage; and harvesting of crops.

Physical geography and climatology.—Dews, frost, fogs, clouds, rain, hail, snow and winds: local causes affecting climate, such as proximity to mountains, to forests, or to bodies of water; effect produced by removing forests, or by planting screens of timber; meteorological instruments, their methods of use and advantage to the agriculturist.

Horticulture.—Hotbeds, their construction and management; methods of propagating plants by layers, budding, grafting, &c.; varieties of small fruits, and best method of cultivating them; general management of nurseries; landscape gardening.

Second year.

Chemistry.—The laws of chemical affinity and combination; its application to arts and manufactures: chemistry of germination and nutrition, of vegetable growth and of fermentation; analysis of minerals and soils; of manures and ashes of plants.

Zoology.—Principles of classification and natural history of domestic animals; comparative anatomy and embryology; entomology, including classification of insects, habits of noxious species, and best means of checking their ravages, and habits of useful species.

Practical agriculture.—General principles of farm economy; animal, vegetable, and mineral manures, their mode of application; preparation of the soil for particular crops; management of grass lands; improvement of soils by drainage, sub-soiling, &c.; industrial statistics.

Third year.

Forestry.—Planting and management of forest trees; soils adapted to their growth; relative value of different kinds of trees for fuel, building, and other purposes.

Agricultural chemistry.—Composition of soils; the relation of air and moisture to vegetable growth; chemistry of the various processes of the farm, as ploughing, fallowing, draining, &c.; preservation and composting of manures; chemical composition of various crops, and of the dairy.

Animal husbandry.—Breeds of domestic animals, their characteristics and adaptation to particular purposes; principles of stock-breeding; veterinary surgery and medicines.

In closing this brief review of what has been done in establishing industrial colleges, it is proper to congratulate the farmers of the country on the advantages which must flow from this princely donation of nearly 10,000,000 acres of the public lands. It has not only turned public attention to the desirableness of a higher education of the industrial classes, but it has also supplied, in a great part, the means for procuring it. Something will be gained in all the States by the use of this fund. It may be, in some cases, injudiciously appropriated; the instruction may be superficial, or have little practical utility; but it is an important step in advance. In all cases we may hope that something will be learned from sister institutions; that experience will correct mistakes; and, as the public mind more carefully considers the subject, additional facilities for giving instruction and for elevating the character of the colleges will be afforded, either by private benefaction or by the liberality of the State. It will be seen that some of the States have so wisely managed the funds set apart for this purpose, and have laid so broad and deep the foundations of the new institutions, that they will prove to be of inestimable value in the long future of the country. It might seem invidious to particularize them, and it is not necessary to do so. Each of our readers will form his own conclusions. It is a source of gratification that so many give prominence to practical instruction in agriculture. The grant was intended for the benefit of farmers; for those whose leisure or whose means do not allow them to pursue an extended course of study in existing schools, and who design to follow the business of farming. It does, indeed, provide the means for becoming skilful in the mechanic arts, but the masses in our country are farmers, and farming is the foundation on which our national prosperity rests. It was intended to give dignity to labor; to elevate it above mere drudgery and routine, and to render it intelligent. It wisely provided for the purchase of a farm as an appendage of the college, for the theories of the schools can never alone make practical men. It is only as these theories are tested by practice that they have value. Besides this, if young men are to be farmers, they should not for years be withdrawn from labor. They must not lose their habits of industry, nor their taste for rural life. They must not acquire the pernicious notion that labor is degrading, and that "gentlemen" cannot engage in it. Instead of regretting, with a writer in the North American Review, that the term "agricultural colleges" has been popularly used, it may be deemed an appropriate designation for institutions of learning, formed for the express purpose of educating the young for the noblest pursuit in which man is ever engaged. It is the term used in the reports on the bill, and in all the discussions on its passage, both in 1858 and 1862. If it is a reminder of labor and of tilling the soil, so much the better and more properly is it used.

It was, doubtless, intended by the framer of the bill, and expected by its advocates, that a farm for experimental purposes would be attached to the college, and that manual labor, to some extent, would be required of the students. The language used by the advocates of the bill, and especially by its framer, leads to this construction of the intent of Congress. When the bill came before the House in 1858, on the report of the Committee on Public Lands, Mr. Morrill said:

We need to test the natural capability of soils, and the power of different fertilizers: the relative value of different grasses for flesh, fat, and milk-giving purposes; the comparative

value of grain, roots, and hay for wintering stock; deep ploughing as well as drainage; the vitality as well as the deterioration of seeds, breeds of animals, and remedies for the potato disease, and for all insects destructive to cotton, wheat, and fruit crops.

And again, speaking of the different governments of Europe, he said:

They have established ministers of instruction, model farms, experimental farms, botanical gardens, colleges, and a large number of secondary schools for no other purpose, and they need no higher or nobler, than the improvement of the industrial resources, the farms and farmers of the respective countries.

In his speech in 1862, on the passage of the bill, he used this language:

The opportunity of obtaining a sound education, adapted to the wants of the individual, will be offered at reduced rates; a love of useful labor will be promoted, and thus health and usefulness must be advanced.

After speaking of our colleges and classical schools, and saying that they are chiefly occupied in supplying the learned professions, he continued:

Other institutions are wanted where the idea of labor shall be uppermost, and where the *esprit du corps* of those instructed will seek highest honor in no other direction.

These extracts show conclusively what was the "intent" of the framer of the bill, and of Congress in regard to a farm, and to manual labor to be performed on it by the students. And we appeal to all practical men, to all intelligent farmers, whether agriculture as a science and an art can be successfully taught in any other way than by reducing theories to practice, and testing, by experiment, the teachings of the lecture-room. If young men are to be educated for professional or mercantile pursuits let their training be adapted to the ends they have in view; but if for a farmer's life, the most healthful, most independent, and noblest mode of life, they must not be withdrawn from labor at a period when tastes and habits are forming, nor from the occupations which demand for success an ever increasing interest in them. We rejoice in witnessing the highest possible mental culture, in whatever direction it is found. Our old colleges are noble institutions which deserve well of every lover of his country. There is to be no rivalry between them and those under consideration, unless it be in striving which shall do most to elevate the character of our citizens, and to promote the enduring prosperity of our common country.

THE STATE REPORTS OF AGRICULTURE.

A concise digest of the salient points and more important and practical features of the latest issues of the several State reports, published by State boards of agriculture, or agricultural societies, is deemed a desideratum in the national report of agriculture, both for the intrinsic value of the matter collated, and for the purpose of showing the progressive agriculturists of the whole country what the several States are doing for the common cause. Such publication will also prove a stimulus to the many States which either possess no active boards or societies, or fail to compile and publish their transactions. It is the aim of this department of the government in every practical way to co-operate with town, county, and State organizations in aid of agriculture; and this plan, of uniting by a chain of mutual interest and profit the State with the national reports, is believed to be eminently useful and entirely feasible. Want of space prevents the presentation of valuable matter in detail; it can only be expected that important facts or statements shall be hinted at or given in epitome, that readers of this volume may be incited to examine the several documents mentioned, and thus a wider appreciation of valuable local matter may be secured.

Although it may be said that but little has been found in these reports (those for 1866) which was not known before, yet the verification of much that was known, or but partially established, has been in many instances of sufficient importance to demand a record in this review. It is possible, also, that subjects meriting attention have been overlooked, though the design has been to notice everything of value. Many of the discussions of topics presented by members of the State boards and societies are instructive, and will be found suggestive and valuable, and it is regretted that so little room can be given them, notwithstanding the fact that comparatively few resulted in the establishment of principles. The latter, it is true, is difficult where circumstances attending the experiments are diverse, and when possible, and the matter is of sufficient importance, to establish uniform practice in any branch of agriculture, means should be taken by the State boards to secure such result. From reading the discussions, we are more than ever satisfied that these influences are so diversified that they cannot always be applied with safety even to a neighboring farm; that what would be good and safe practice on one farm, or in one neighborhood, or one section of country, would not be good practice on another, even in the same State. It is, therefore, very important to have the successful practice on one farm compared with the best practice on others in the same neighborhood, and not only results but the causes in detail given, which can be best effected through local societies or farmers' clubs. These results should be reported to the county societies, which, when compared and well digested, should in their turn be sent to the State Agricultural Society, to be prepared for publication in the annual volume. We have much to learn before it is fully established that we know where and how to put the right crops in the right places.

It is to be regretted that out of 20 State Agricultural Societies in correspondence with this Department but 10 have issued reports of their transactions for 1866. Of the 10 not issuing reports, the secretary of the Delaware State Society writes:

No other reports than those found in newspapers of the locality after exhibitions have been published.

The secretary of the Kentucky State Agricultural Society writes:

Our State has made no appropriation for the society since 1861; hence we have not had the means to publish a report. We have just been able to hold a fair yearly, offering only small premiums, just keeping the organization alive, hoping our legislature would be more liberal. So far we have been disappointed.

The secretary of the Maryland State Agricultural Society writes:

Our society has not as yet made any publication of reports. We have but recently organized, the old association having ceased to exist at the beginning of the war. The State has appropriated $25,000, and the city of Baltimore a like amount, for the purchase of a suitable show ground; and it is the intention of the officers to prepare at once for an exhibition this fall.

The secretary of the State Agricultural Society of New Jersey writes:

In reply to your favor requesting a copy of the publications of this society since 1860, I have the honor to say that I take no very great pride in saying there are none such. During the war our society was quiescent, holding no fairs. In 1866 the society was formed into a joint stock association, and purchased grounds in the vicinity of Newark for a permanent establishment.

The secretary of the State Agricultural Society of Pennsylvania writes:

I regret to inform you that we have published no volume since 1863. Our transactions are published by order of the legislature; the appropriation has failed since 1863. We have sufficient matter to make two volumes.

The secretary of the State Agricultural Society of Wisconsin writes:

When the war broke out the legislature, with our concurrence, stopped publishing; happily, however, the last legislature passed a law providing not only for filling the gap to the present, but for the future, regular, annual publications of the society's reports. I am now preparing the material for a volume, embracing the official transactions of the society for the years 1861-'62-'63-'64-'65-'66-'67.

MAINE.

The eleventh annual report of the secretary of the Maine Board of Agriculture for 1866 occupies the first half of a volume of 207 pages. At the meeting of the board in January, 1866, several reports were made by committees on subjects submitted to them, the more important of which may be summarized as follows:

Farm management.—"Can farming in Maine be conducted with success, as compared with other branches of husbandry?" This was answered by the committee emphatically in the affirmative. The report states that the sum of $97,424,385 is invested in farming in the State, and that it pays a dividend of 14 per cent., the orchard products alone footing up $501,769.

The question, "On which can a farmer live the easier, a farm of 200 acres or more, or one of 40 or 50?" was answered in favor of the larger farm, which realizes the greater profit if the occupant has sufficient labor to cultivate it.

"What products can be sold off the farm with the least detriment to its fertility, and at the same time be profitable to the producer?" In answer to this question it is argued that fertilizers are absolutely necessary to keep up the productiveness of the land, and that the manure made upon the farm is the only fertilizer that can be relied upon, to make which animals must be fed upon the farm; hence, the hay, corn, and grain should not be sold in any other way than in the shape of animals and animal products. The increased growing of fruits and wool and the manufacture of butter and cheese are recommended as productions not only profitable, but which can be sold off the farm without detriment to it.

"Are oats an unduly-exhausting crop to seed down with?" "Such is the opinion of many of our best farmers," says the committee, "which opinion has been borne out by practical experiments." The committee give reasons why the crop is no more injurious than buckwheat and some other crops, but come to no satisfactory conclusion in accounting for what they deem an error; they admit, however, that oats are a very exhausting crop.

"Can effective measures be adopted to increase our crops of hay without the use of barn manures or concentrated fertilizers?" The following treatments of the soil are given as substitutes: Ploughing and seeding in clover, turning the latter in when ripe enough for the seed to grow; plough in June and sow buckwheat, Indian corn and other grain, turning them under in August, and then seed with timothy and clover for a crop of hay the next season; summer fallowing; the harrow can be used in August on non-producing meadow land with good results; cutting clover and timothy below the lower joint destroys the plant; feeding on meadow lands after the crop is taken off is injurious; changing from meadow to pasture and the reverse is beneficial; drainage where required is also effectual in producing increased crops.

"Ought the more extended culture of peas and beans to be recommended?" As concentrated food, always ready for use on the farm, is very important, a liberal cultivation of the pea and bean is recommended.

"Should the use of horses be encouraged to the exclusion of oxen for farm labor?" The conclusion reached was, that the farmer who keeps oxen is more successful than he who keeps horses to the exclusion of the former.

"Is the ox-yoke, as used with us, a natural or an absurd implement of draught?" The fact is stated that the old mode of lashing the yoke to the heads of oxen for the purpose of draught has experienced no change for 300 years among the Spaniards, and it is a matter not satisfactorily settled by experience whether it is not more humane and quite as effective as the present cumbersome yoke. The assertion is made that lashing the yoke to the heads is an "ill-founded notion of the ability of the ox to force a load back by the horns." The committee recommend thorough experiments by farmers of Maine, to ascertain the best plan for yoking oxen for draught.

The "winter care of farm stock" the committee deemed a subject demanding attention from the farmers of Maine, as there is very general neglect in sheltering stock from the severe weather of that inclement season. Feed the best on the farm as long as it lasts, for if the stock falls off towards spring they can be more easily restored to proper condition.

"What lessons in agriculture are taught by the peculiar circumstances of the past few years?" The committee report, first, the cultivation of vegetables and small fruits more extensively; and second, the adoption of more modes of culture by the aid of improved implements. There are also some excellent recommendations by the committee on "the cultivation of rural taste, architecture," &c.

On farm crops.—In the discussions of the board the statement was made that apple trees can be grown successfully in the hilly parts of Maine. A return of net income from four acres devoted to apples gives a yield of $750. The Baldwin is declared to succeed well on high lands, and to be an excellent apple for transportation. The next apple for profit is the Rhode Island Greening. The soil along the seaboard is not favorable for apple trees. The hop is recommended as a profitable crop for Maine, and a detailed report on its culture is given.

An article on "Ploughing and Manuring in Autumn" contains much good, practical matter to prove the great advantage there is in both ploughing and manuring for all crops which require the soil to be prepared by the plough, especially in climates where the period of non-growth is longer than the plant-growing season. It prepares the soil to commence the growth of plants in the fall, and thus lengthens the season for growing.

The Jerusalem artichoke (*Helianthus tuberosus*) is highly recommended in an article of some length as a valuable food for domestic animals, claiming that it compares favorably with the vegetable roots in common use, that it produces fair crops without manure and with little cultivation, and that it has other advantages to recommend its general recognition.

"The Value of Night Soil" on land is presented, and a mode of saving it suggested, by dropping peat or loam daily on the deposits in the vault. The writer has tried it and thus made a very valuable compost.

"The Horse; his Nature and Treatment," by M. A. Cumming, V. S., of New Brunswick, is a valuable article, containing a great amount of practical information in regard to the treatment of this animal, the abuse of which the writer thinks arises principally from ignorance. Proper ventilation and a constant supply of pure, fresh air are requisite; and, in supplying them, draughts should be admitted above the horse's head instead of below his heels. When fed on hay and grain he must have a portion daily of root feed, the carrot and the Swedish turnip being preferred. To supply muscular wastes those substances should be fed which contain the largest amount of glutinous or albuminous matter, such as peas and beans; and, to keep up animal heat, sugary, starchy, and oily food, as barley, linseed, and corn. Oats have an intermediate place. The proper shoeing of the horse is much neglected by having the toes too long, &c., and the line of draught in harnessing is not properly observed, which should be at right angles with the shoulder blade. The cultivation of distinct breeds is recommended for the different purposes for which the horse is to be used.

Industrial Colleges.—The subject of "Colleges for the Industrial Classes," contemplated by the act of Congress of 1862, is treated at considerable length in several papers under the headings, "Agricultural Schools," "Scientific Schools," and "Industrial Colleges," in which the whole range of agricultural education is embraced. The practical exemplification of the instructions given in the school-room is recommended to be observed by the student in and on the soil, whatever pursuit may be determined upon for the future. The health imparted to the student by manual labor, especially upon the soil, is deemed essential. The location of the State Agricultural College has been made at Orono, Penobscot county.

Forty pages of the report are occupied by two excellent articles on cross-breeding of animals, especially of the horse and sheep; two on the cattle plague in Europe; one on the structure, functions, and diseases of the udder of the cow; one recommending the adoption of the decimal system of weights and measures; and one urging the appointment of a State entomologist, which the board recommended unanimously.

County agricultural societies.—An abstract of the operations of the county agricultural societies, as reported to the secretary, occupies 46 pages. The reports exhibit, says the secretary, more of energy and activity than has been manifested for some years past. Sheep husbandry has increased considerably and the breeds have been greatly improved. Of 24 county societies reporting, the total amount paid for premiums for the year 1866 was $7,660, being an average of $319 for each. There is but one report on the cost of raising a bushel of corn, which states it at nearly 26 cents, while the cost of producing a bushel of wheat was nearly 73 cents. The corn sold for about $1 50 and the wheat for $3 per bushel.

Selected papers occupy 161 pages of the report, as follows:

"*Power, force, and matter*—Their diversity, unity, simplicity, and harmony the basis of all science and all knowledge;" by Professor J. B. Turner. Taken from the transactions of the Illinois State Agricultural Society.

"*The cultivation of field crops and preparation of soils;*" by Professor J. B. Turner, taken from the same volume. The author argues that deep ploughing is required to secure the influence of heat, light, air, and water, which contribute nine-tenths of the productive elements of the plant; that no soil can be crushed too fine for any crop, while it is usually left far too coarse for all crops.

"*History and characteristics of Galloway cattle;*" by Sanford Howard, from the report of the Secretary of the Michigan Board of Agriculture. The article is interesting and profitable to breeders of cattle, as the Galloway is said to be a race adapted to the northern States generally. Their hardy nature, aptness to fatten, and the superiority of their beef, would seem to commend them. They have been but recently introduced into the United States, and are highly approved by those who use them.

"*Management of pastures;*" by Sanford Howard, also from the Michigan report. The writer states that an experienced cattle-feeder could not so easily fatten stock on grass raised on newly seeded grounds as on that from grounds put down many years ago, or from pastures that had never been broken up. One great source of failure and decline of grass in old pastures is over-stocking. A top dressing of sawdust, in which the liquid manures have been absorbed, applied in fall or spring, gives great vigor and growth to grasses. It is better and cheaper to apply this or other manures to old pastures than to plough and re-seed. In reference to soils it appears—

1st. That, on some soils, grasses will live so short a time that it is not an object to endeavor to continue them for permanent pastures. Such land, if suited to grain or other cultivated crops, may be brought under a system of rotation, if not devoted to forest trees.

2d. That some soils may be kept permanently in grass by occasional scarifyings, or harrowings, with top dressings of suitable manures, and surface re-seeding of spots where the sward becomes weakened.

3d. That some soils which are particularly natural to grass, if once set with the proper species, may be kept in pasture for an indefinite length of time, in many cases without manifest deterioration, through fertilizers, as bones, ashes, plaster, &c., which may be advantageously applied at intervals.

A paper by John Johnson, jr., taken from the Massachusetts State Reports, on the same subject, follows the foregoing.

Bread-making.—Two articles on bread-making, one from Illinois and the other from Massachusetts, can be read with profit by the majority of housewives. The following is detailed as the plan pursued by good bread-makers in Massachusetts:

Success depends in a great measure upon good judgment, faithfulness, and patience in working, and in using the right materials. Sift five pounds of good flour, and put in an earthen pan suitable for mixing and kneading; take two potatoes the size of the fist, boil them, mash and mix with half a pint of boiling water; a fresh yeast cake, of the size common in the market, is dissolved in water, and the two solutions mixed together and put in a warm place to ferment. As soon as it commences to rise, or ferment, which requires a longer or shorter time as the weather is warm or cold, pour it into the flour, and with the addition of a pint each of milk and water form a dough, and knead for a full half hour; form the dough at night, and allow it to stand until morning in a moderately warm place; then mould and put into pans and let it remain until it has become well raised; then place it in a hot oven and bake. The points requiring attention are: First, the flour must be of the best quality; second, the potatoes should be sound and mealy; third, the yeast cake is to be freshly prepared; fourth, the ferment must be in just the right condition; fifth, the kneading should be thorough and effective; sixth, the raising of the dough must be watched that it may not proceed into the acetic fermentation, and cause the bread to sour; seventh, after the dough is placed in pans it should be allowed to rise, or puff up, before placing it in the oven; eighth, the temperature of the oven, and the time consumed in baking have much to do with the success of the process.

Then follows an instructive article by X. A. Willard, describing a visit 'Among the Butter-makers of Orange County, New York, with Suggestions on Cheese Dairying;" and an essay on "Parasites and Parasitic Diseases as Affecting Domesticated Animals," by an English writer.

An article on "The Management of Agricultural Fairs" closes the report. The writer suggests that agricultural fairs should raise their standard of usefulness; meetings should be held at the fairs for discussions on farm matters; premiums should be awarded to committees for superior reports; reports should be published; secretaries should be required to furnish full printed reports of the doings of the societies for which they act; silver plate instead of money should be given for premiums; horse racing should be discountenanced, substituting speed against time, each horse by himself, in a quiet way.

MASSACHUSETTS.

The Fourteenth Annual Report of the secretary of the Massachusetts Board of Agriculture is a volume of 526 pages. It is addressed to the legislature of the State, and opens with congratulations that "the farming as well as the other industrial interests of the State have been marked by a reasonable degree of prosperity" during the year.

Agricultural education.—The connection of the State Board of Agriculture with the Massachusetts Agricultural College is the subject of one of the first lectures before the board, in which it is stated "that every mode of improving agriculture by process of mental discipline has immediate reference to the *practical business of the farm.*" The subject elicited a discussion by the board, in which it was generally admitted that agricultural education is in its infancy, and that no place needs correct information on agricultural experience more than Massachusetts. Every report in the volume has an article or address on agricultural education, all urging this important subject upon the attention of farmers, who have so long suffered for want of sufficient knowledge respecting their own profession. The board of agriculture, by an act of the legislature, has control of the Agricultural College of the State, which is esteemed a matter of great importance. A recommendation has been made by the board that each agricultural society establish at least one scholarship in the college. This is an excellent suggestion, and deserves the attention of other State boards where colleges may be established. A provision of the law establishing the board is worthy of notice here, and reads as follows:

The secretary of the board is authorized to appoint one or more suitable agents to visit the towns in the State, under the direction of the board, for the purpose of inquiring into the methods and wants of practical husbandry; ascertaining the adaptation of agricultural products of soil, climate, and markets; encouraging the establishment of farmers' clubs, agricultural libraries, and reading rooms, and of disseminating useful information on agriculture by means of lectures and otherwise.

"What Chemistry has accomplished for Agriculture," was presented in a lecture before the board, showing that without the aid of chemistry, agriculturists would be groping in comparative darkness, and have feeble hopes of rapid advancement in the future.

Management of fairs.—In an article on the management of agricultural fairs, it is stated that the South Carolina Agricultural Society was established in 1784, being the first in the United States; and that the next was in Philadelphia, the same year. Horse-racing, jugglers, gambling, &c., as adjuncts of fairs, are severely condemned, and legitimate exhibitions for the promotion of agriculture strongly urged. Unless farmers and their families will manifest a healthy and hearty interest in the management of agricultural fairs, but little good can be expected from them; and they must be conducted so as not to shock the moral sense of the best portion of the community.

Cattle husbandry and the dairy.—The subject of cattle husbandry was discussed at one of the meetings of the board, in which Professor Agassiz took the lead. He laid down the general principle that the purity of the ancestry of parents was even more important in breeding animals, to insure purity, than that of immediate parents; to prove which he gave numerous examples. It is also necessary to avoid copulating inferior animals with the female, as it always has an injurious influence upon the offspring that follows, especially, when a wrong beginning is made. It was stated that, to insure as far as possible conception, as well as the getting of male animals, the female should not be permitted to have the male until 36 or 48 hours after being in heat. The great cause of the deterioration of animals in New England is their being permitted to breed at too early an age. The discussion was closed by the passage of a resolution to secure the collection of statistics relative to the propagation of domestic animals. A similar system, if adopted in all the States, would cause a record of many valuable facts necessary to a proper investigation of the principles of correct breeding.

In reporting upon stock, the committee commenced with the Jersey cow as the best for milk, and declare that experience has proved they can stand as much exposure as any of our natives; some saying that when short fed they do not suffer as much as the native stock, and that they do not fall off in the quantity of milk in as great proportion as the natives on short or poor feed. Working oxen receive especial mention, as they are esteemed the basis of the motive power on the farm, and the advice is given that they should be trained for light as well as heavy work. It is stated that a farmer who kept 20 cows, after a trial of the different breeds, gave the preference to the Ayrshire for a milk dairy, because they are hardy, and give good returns for the quantity of food they consume.

In regard to diseases of the cow, it is claimed that garget may be easily cured if the remedy be applied in time, by giving one ounce of saltpetre, and washing the bag in warm soap-suds; let the bag dry, then rub on bacon fat, which will bring the cow all right in a day or two. The same farmer thinks the manure will pay attendance and interest on the value of the cow, and all expenses except food.

The following mode of butter-making is given by the lady who received the first premium at the Essex fair: "The milk was strained into tin pans and placed in a cool and well-ventilated room. The cream was taken from the milk in 36 hours after being milked, then churned, and salted to the taste after standing in a cool place 24 hours It was then worked over till the buttermilk was all out." Butter, on a Massachusetts farm, next to hay and live-stock, possesses the greatest money value of all that is produced.

Horses, sheep, &c.—Very little is said in commendation of the purity of the breeds of horses examined by the committee. Of sheep, the long-wooled are strongly recommended, as the most profitable for the farmer to raise. More attention is urged in breeding swine, so as to introduce or create a better stock of hogs than is now raised in the State. Several statements are presented exhibiting excellent profits in breeding poultry. In one instance it is stated that

$100 were cleared from an original stock of 30 chickens. The breeder preferred the full-blood Brahma, though he also keeps the Sicilian and a few other breeds.

Pasture and grass lands.—The farmers in western Hampshire hold that ploughing up good natural grass lands is malpractice in farming, and that manure should be applied upon the surface in the month of August or September. Improper cropping, overstocking, and allowing brush and brambles, foul grasses and noxious herbs, weeds, &c., to mature and scatter their seed, are noticed as fruitful sources of killing out pasture lands. Sheep are used, to some extent, to crop off these noxious plants; and shade trees are recommended both as an embellishment of the fields and for the comfort of the herds and flocks. There is one recommendation deserving especial notice, viz: in seeding lands for pasturage we should determine, as far as possible, for what use they are more particularly desired, for fattening or for dairy purposes; because experience and observation have taught that the same pasture or the same variety of grasses does not produce meat and milk with equal facility. It is reported that in the county of Bristol "less land is cultivated than formerly, with more manure and cleaner culture," the result being, of course, better crops with less expense.

Root crops.—At one of the meetings of the board the virtues of carrots, English turnips, rutabagas, potatoes, &c., as food for stock were compared, all the speakers agreeing as to the value and utility of the root crops as food for animals, but differing as to which is the best; the majority, however, being in favor of the carrot. The modes of cultivating and using them were entered into quite extensively in the discussion, in which the experience of all was that any of the roots named could be fed to great advantage, raw or cooked. The potato, however, was the least used, as man required this root almost exclusively for himself. All agreed that dry feed in winter should be accompanied with a liberal supply of roots. One of the greatest essentials in growing roots, as expressed by all, is to secure good and pure seed, as the failures in raising good crops can generally be attributed to bad seed. Raise the seed on the farm, if possible; the last resort is the store. Late sowing is recommended, so that the crops can be stored away just before the frost would affect the roots when exposed in the air to dry before storing. A cellar under the barn floor is generally used for storing the crop. The best seeds of the carrot are on the centre stalks. Plant carrot seed in drills, one to a half inch, only the largest and plumpest seeds, the rows 15 inches apart. The rows for mangolds should be 22 inches apart. Good rich soil is required to raise root crops successfully. On the value of feeding roots, one of the speakers said:

> I always give my horse more or less roots, and if I had two tons and a half of hay for a full-sized cow, I would sell 20 per cent. of the hay and purchase with the money all the roots I could, and feed them in addition to the other 80 per cent. of hay, and my cow would give me more milk and come out in better condition in the spring.

Soil for plants, &c.—An essay on "Plants as an Indication of the Nature of the Soil," which was adopted by the board, is based on the proposition that as all kinds of vegetables are continually varying in their growth, quality, production and time of maturity, they can be made to adapt themselves to almost any soil or climate if the farmer will do his part in selecting the proper seeds, &c., instancing the diversity of climate in which they have been made to produce remunerative crops. In another article, on the "Adaptation of Crops to Soils," it is claimed to be profitable, as well as necessary, to amend soils, to some extent, by dressing those which are sandy with clay, and the reverse, to supply the proper food for the plants to be grown upon them, as well as to enrich them with manures.

Lectures on the "Varieties of Plants" were given by Professors P. A. Chadbourne and Agassiz, both of which contained much valuable matter for the agriculturist. "Transplanting Fruit and Forest Trees" is the title of an essay in which many good rules are laid down not generally known, or if known not sufficiently followed. The writer says that "all mangled roots should be trimmed

carefully, or entirely removed; and all roots cut off with the spade or other blunt-edged instruments should have the ends smoothly pared to where the wood is clean and sound. Where trees are treated thus and set, a row of fibrous roots at once shoots into the soil from the clean-cut end." In evergreen trees this course is not so essential at all times. Holes, to receive the trees, should always be made sufficiently large to receive the roots without cramping. Where the trees are exposed to raking winds place coarse litter about the roots, and upon that some flat stones to keep the mulch in place and the tree in position. Stakes should never be used for the latter purpose. An experienced cultivator of the cranberry contributes a short essay, in which he enumerates many difficulties in raising this desirable fruit, and concludes with this declaration:

The perils which I have enumerated are sufficient to show that the cultivation of the cranberry is very hazardous without a ready and abundant supply of water, and that the crop may then be lost by causes beyond control.

Grape culture.—Hon. E. W. Bull, of Concord, addressed the board on the subject of "grape culture." He stated that it is a demonstrable fact that grapes can be profitably grown in Massachusetts in the open air. He recommends, as proved by his own experience, the growing of seedlings, and the reproduction from the seed, as improving the quality of the fruit and better adapting it to the climates where grown. Hybridizing, or cross-breeding, is also recommended, but he thinks the other the best mode, although it is liable to the objection of taking a longer time to arrive at results; but when obtained they are more satisfactory and more lasting. He says that we prune too much, and manure too much; and as the roots require considerable heat they are permitted to run too far below the influence of the sun's rays. He gives other important experiences in which he differs from grape-growers generally. His experiments were principally with the Concord. Mr. Haskell said his experience in regard to the seedlings did not sustain that of Mr. Bull, but that cross-breeding, by using the pollen of the foreign on that of the native, produces a hardy vine. He recommended his practice of planting the seeds of all the good fruits eaten in some place where they would not be disturbed, as something good might be produced. Mr. Bull said that if one in a hundred of his seedlings from the Concord proved good he was amply repaid for the trouble.

Farms, farm buildings, crops, &c.—From the reports of the committees appointed to report upon farms, farm buildings, &c., the following points are extracted: On one farm of 26 acres the net proceeds were $734 82, after paying for ditching, setting trees, diking, &c. The barns examined generally had cellars, which are strongly commended. In the report on "reclaiming swamp lands" two statements are given which prove that great profits result from draining such lands, when properly done. The report on orchards presents nothing especially new; it exhibits this fact, however, that fruit-raising, with care, is profitable in Massachusetts. The same remarks will apply, also, to the report on vineyards.

The report on manures recognizes the value of some of the condensed fertilizers of the day, and recommends continued experiments to test their value, as applied to both particular crops and general agriculture, "especially when we remember," say the committee, "that the good cultivator always returns to a well prepared manure heap, the product of his stable and farm yard, with a confidence which chemistry and the guano islands have not shaken." The report on corn says "the corn crop is the crop of New England, next to the hay crop the most indispensable," and that the fodder from an acre producing 50 bushels of corn will be about two tons, and will pay for the cultivation and harvesting after the corn is planted. From three statements made and verified by the committee, the average cost of producing a bushel of dry shelled corn was shown to be 69 cents. One statement made the cost of raising 22 bushels of wheat $25; 32½ bushels of rye, $18 95; 43⅝ bushels of barley, $29 90;

52½ bushels of oats, $15 50. Of root crops an average of 793 bushels of onions per acre was reported; of carrots, 1,000 bushels per acre; of potatoes, from an average of three statements, the product was 316 bushels per acre, at an average cost of a fraction less than 34 cents per bushel; of cabbages, the Stone-mason variety is highly commended for a fall variety, and cabbages are recommended as not only an excellent milk-producing food, but also good for forming flesh. Sandy soils are reported to be the best for the production of root crops, if kept rich.

In a report on bread and bread-making "the conclusion is reached that very many families have hardly yet learned what good bread is, and that there is a wide margin for improvement." Skilled hands are as essential as good materials.

The subject of peat fuel was presented in a very interesting and instructive lecture by George B. Loring, in which it is fully demonstrated that there are many varieties of peat, especially those where ligneous substances predominate, excellent and as economical as any other kind of fuel for all purposes. It is also claimed that in smelting iron, peat is superior to the best charcoal, as proved by thorough and repeated tests in England. Peat prepared by hand and dried has been used in driving locomotives at express speed, one and one-fourth of a ton being equal to one ton of coal.

The culture of fruit was discussed by the board, eliciting much valuable information in regard to the varieties suited to certain localities, the mode of cultivating orchards, &c.; but no general principles were agreed upon.

There was also an essay read on the construction of houses for the preservation of fruit, and another disapproving of the culture of chiccory, which essay was approved by the board.

After the annual report of the trustees of the Massachusetts Agricultural College, the secretary concludes his report with the following:

> The true science of agriculture has probably never made so great advances in the same length of time as during the past year, and the future, therefore, is full of hope.

Financial.—In the appendix to the report are some very valuable and neatly arranged tables, giving the financial transactions of the 26 county societies in the State for the year, from which we extract the following:

Receipt from all sources	$85 885
Premiums and gratuities paid	34,934
Total disbursements	80,617
Value of real estate and personal property, after deducting indebtedness	536,906
Permanent fund	236,626
Paid in premiums for farm improvements	1,055
Paid in premiums for live stock	12,389
Paid in premiums for farm products	4,397
Amount awarded for all objects strictly agricultural	127
Amount awarded for objects other than agricultural	2,521

Number of persons who received premiums and gratuities, 4,945.

RHODE ISLAND.

"Transactions of the Rhode Island Society for the Encouragement of Domestic Industry in the year 1866," is the title of a modest pamphlet of 92 pages. As the industrial interests of this State are chiefly absorbed in manufacturing, practical agriculture does not receive that attention in the transactions of the board which its importance seems to demand. The executive committee report that the meetings of the board have not been full at any time, and the attendance of members is very irregular. No cattle show or exhibition of any kind was held by the society during the year. As but one general show of this kind is held yearly in the New England States, the project of having an independent annual exhibition is seriously entertained by the Rhode Island society, as suggested by some of its members. A revival of these annual exhibitions is the only sure way to awaken an interest in agricultural matters, which seems to have

almost died out in the State. The expenditures of the society for the past year were $1,933 66, and it has a permanent fund of $17,600. The report further states that it is a question whether any grape in our climate can be successfully cultivated for wine; and the committee recommend the appropriation of the lands and sterile soils of the State to the cultivation of the sweet potato. The "Williams' Early" corn is recommended for early ripening. The society appears to have had an existence for 47 years.

The documents accompanying the report of the standing committee are as follows: two letters from Elisha Dyer—one on the Hockheimer vineyards, the other relative to the manufacture of the sparkling Hock and the Moselle wines; both of interest to the wine manufacturer. Following these is the report of the committee on the cattle plague in Europe.

A synopsis of the agricultural statistics of the State, taken by order of the General Assembly in June, 1865, is as follows:

Acres of land in the State termed ploughed, 37,786; mowing, 101,243 acres; pasturing, 152,457 acres; unimproved, 201,090 acres.

The leading productions are hay, Indian corn, oats, potatoes, butter, cheese, milk, fruit, market garden stuff, onions, turnips, eggs, and poultry. There were only 723 bushels of wheat raised in the State that year.

Farms.—Number of farms of 500 acres and over, 37; of 300 and under 500 acres, 115; of 200 and under 300 acres, 310; of 100 and under 200 acres, 1,376; of 50 and under 100 acres, 1,715; of 20 and under 50 acres, 1,493; of 10 and under 20 acres, 696; of, and under 10 acres, 744.

Cash value of farms, including buildings, $24,389,242; of stock, $2,066,488; and of tools and implements, $717,127.

Patents, &c.—During the year 127 persons and firms of the State are reported as having taken out patents for inventions and designs.

The report closes with a necrological report of its members who died in 1865 and the meteorological record of the year.

CONNECTICUT.

The report of the secretary of the Connecticut State Board of Agriculture for 1866 contains 240 pages. At the first meeting of the board in that year the secretary and delegates were appointed to visit each of the agricultural exhibitions of the State.

The secretary visited nine of these exhibitions, upon six of which he reports favorably; one was tolerable, one indifferent, and one discreditable to the society. In the majority of them the horse appears to have had the largest share of the premiums, which the secretary condemns as injurious to other interests.

In some sections the hard winter of 1865–'6 injured the grasses on the meadow-lands; apples and other fruits were also a partial or total failure in many parts of the State, and the suggestion is made that the destruction of the forests which formerly protected the orchards from the northern winds is the probable cause. In other respects the secretary reports that, with few exceptions, the labors of the husbandman for the year were abundantly rewarded.

From the reports of the committees appointed to visit the several county exhibitions, it appears that the farmers of Connecticut give more attention to raising the Devon stock of cattle than any other, and that the Alderney also has a prominent place; their working oxen are principally taken from the former, of which there were some large and fine specimens on exhibition. Tolland is reported as the poorest county in the State for general agricultural purposes, the manufactories being considered "the saving of the county, as the farmers have good cash markets at their doors for all they produce. Twenty years since a large portion of the farmers were in debt; now, while living in greater comfort than formerly, most of them are laying up money."

From a tabulated statement by the secretary, made up from reports of several county and three town societies, the aggregate receipts from all sources are stated to be $16,317 98 for the year, including $1,400 from the State, being $200 to each county society; and the disbursements $13,840 92, of which $6,742 were awarded in premiums. The awards for live stock amounted to $4,651; for farm products, $978; for agricultural implements, $73, and for domestic manufactures and mechanical inventions, $428. Three medals and 51 diplomas were also awarded. The number of entries is not stated, but there appears to have been exhibited 1,000 cattle, 652 horses, 467 sheep, 121 swine, and of poultry 294. Premiums were paid to 1,193 persons.

Irrigation.—The subject of irrigation occupies 23 pages of the report, 17 pages consisting principally of a lecture before the board of irrigation in California, the remainder being facts presented to the board by its members, chiefly in relation to the beneficial results of irrigation in Connecticut. The testimony in regard to irrigation generally was largely in its favor, as producing results that would, under favorable circumstances, fully justify the necessary expenditure in the increase of all kinds of crops, especially of grass.

Drainage.—Discussions upon drainage, together with a letter on the subject from John Johnson, of Geneva, New York, occupy 38 pages. The undivided testimony of the 25 persons who engaged in the discussions was in favor of very general drainage, statements being made that much land which had heretofore borne fair crops had doubled its yield after judicious draining. Facts were presented to sustain assertions of this kind.

Fruit culture.—Fifty-eight pages are occupied with discussions on the cultivation of fruit and reports (33) from all sections of the State on the success of fruit culture. The same difficulties in raising fruit appear to exist in Connecticut as in all the northern States, but with skill and patience they are overcome, as elsewhere, and the general testimony appears to be that fruit culture will pay when properly pursued, although there were some who said it would pay better to turn their attention to crops requiring less skill and which are more certain, and import fruit from Ohio, apples especially.

Fungi of plants.—Forty pages are devoted to a lecture of Professor Brewer on the fungi of plants, and to the discussions of the board on the points presented. No brief synopsis of the report would interest the reader or do justice to its merits. It contains much valuable information.

Source and supply of nitrogen.—This subject is embraced in a lecture occupying 24 pages, by Professor S. W. Johnson, on "Recent investigations concerning the sources and supply of nitrogen to crops." Space will not permit even a brief statement of the points presented in this interesting paper.

Agricultural education.—An excellent article of five pages on agricultural education, by Francis Gillette, concludes the essays in this report. The closing sentence of the paper is quoted as indicating the writer's position on this important subject, which is now so happily interesting the minds of all thinking agriculturists: "The kind of education needed is that which would qualify the farmer for all his relations and duties, both as husbandman and citizen, and send him forth in the full integrity of his manhood, with a sound and wakeful mind in a sound and industrious body."

The law of the State establishing a State board of agriculture closes the volume. Altogether the report is a very creditable volume, though it is to be regretted that it contains so little in regard to practical agriculture, as pursued in the State.

NEW YORK.

The report of the secretary of the New York State Agricultural Society for 1866, with the accompanying papers, occupies a volume of 1,120 pages, which is the 26th issued by that society.

It opens with congratulations on the advancement of the agricultural interests of the State during the year, and refers to the successful trial of reapers and mowers at Auburn, and highly commends the address of Hon. A. S. Miller, of Illinois, at the State fair.

The report of the 26th annual fair, which was held at Saratoga Springs, September 11, 12, 13, and 14, notices a considerable improvement on previous fairs of the society; but, while there were cattle and sheep exhibited that have no superiors in the world, it is regretted by the reporter that the show of Devon and Hereford cattle was a great falling off as compared with the exhibition 15 years before. Ayrshires then, as now, were confined to few exhibitions. Later fairs have called out a better show of Jerseys than in 1851. As compared with that date the "American Merino," so-called, has thrown its old competitors, the French Merinoes and Saxonies, into the shade; the Silesians have been introduced since. The middle-woolled sheep (Southdown) and the long wools (Leicester and Cotswold) remain about the same. The exhibition of horses of all classes was much below the average.

The improvements noticed are common to those of every State; but the report says that but little advancement has been made in rollers and harrows exhibited at the fair within the past 15 years. Large returns are reported for small fruits, and greater care recommended in packing for market. The display of wheat was not so large as was desirable, nor of as good quality.

The display of cereals generally was not as good as the farmers of New York could have exhibited, which the secretary thinks attributable to the small premiums offered. There was a good display of vegetables, but that of fruit was moderate yet of approved varieties.

From the reports of the evening discussions of the society the following points are taken: That cleanliness is not properly observed in the butter and cheese dairies, especially in milking; that pigs do well on the whey of the factories, if fed after it is 12 hours old, and not after 24 hours; that the Red Dutch and Cherry currants succeed best; that in growing the grape a uniform temperature has more to do with ripening than the soil, and that our native wines are injured by using sugar in the manufacture; that in restoring worn-out lands we must underdrain first, then get rid of weeds, after which sow clover and plough it in; that manure should be made in sufficient quantities on the farm to prevent the land from running down; that timothy seed does best when sown in the fall, and clover in the spring.

The president, J. S. Gould, in his address to the society, expresses regret that the averages of the productions of the State are diminishing, when, instead of diminishing, they could be made to exceed the present yield at least $75,000,000 or more, if the whole State attained the standard of the productions of one neighborhood reported, of which amount $30,000,000 would be clear profit. The reflection is here presented that other States are in the same position. If all the lands in the United States, under cultivation, were tilled as they should be, their increased product would soon be sufficient to pay the whole national debt. He states that sufficient knowledge of the relative value of fat-forming food of animals has not been attained at the rack and trough by experiments; that chemistry has decided it, but practice has not; that there is not a farmer in the State who knows exactly what profit he can make upon a load of any kind of manure; and that the society should establish a system of investigation to settle these and other important matters necessary to be known by the farmer.

He thinks that the time has fully arrived when some important improvements should be introduced into the management of fairs, among which he recommends that the grades produced by thorough-bred stock shall be exhibited side by side with the parents, that the farmer may see the improvement; that the reputation of the society is not sufficiently guarded in the awards of the committees, &c.

Appended to the president's address is a letter of considerable interest, as

illustrating the manner of obtaining accurate information in regard to the crops of the district described. Eight of the farmers met, consulted and compared notes, and thus arrived at a correct conclusion.

The report of the treasurer exhibits the receipts of the year, which were $14,762 80, and the expenditures $7,949 95, a balance of $9,292 39 remaining in the treasury.

At the winter meeting of the society the following statements were made:

That three acres and 151 rods of spring wheat were raised at a cost of $54, and produced 136$\frac{2}{5}$ bushels, leaving a profit of $340 31; that two acres and 42 rods of winter wheat were raised at a cost of $41 20, and produced 112 bushels, leaving a profit of $304 80, that 3$\frac{11}{100}$ acres of winter barley produced 268$\frac{2}{3}$ bushels at a cost of $59 50, leaving a profit of $208 13; that butter should be packed in oak tubs for transportation and keeping; that butter can be made from whey as from cream by the ordinary mode equally as good, the process being patented, and the plan is recommended by the committee; that a dairy-farm in the west of England, containing 300 acres, for which an annual rent of $2,500 is paid, besides tithes and taxes, amounting to $850 more, clears annually $3,050 in gold, although its position, soil, &c., are not better than an average of the other farms in England; that the great defect in American cheese is an improper flavor, which is caused principally by the use of impure milk, and improper curing-rooms; that the cost of ploughing by steam in England is five shillings per acre, by horse-power six shillings per acre, and the average depth of furrow by steam seven inches, done at the rate of nearly one acre per hour; that English farming is much in advance of American farming.

From an article on "Food and its Relations to Various Exigencies of the Animal Body," the main conclusions in regard to the source of fat, as derived from the evidence presented, are as follows:

1. That a large proportion of the fat of the herbivora, fattened for human food, must be derived from other substances than fatty matter in the food.

2. That when fattening animals are fed upon the most appropriate food, much of their stored up fat must be produced from the carbo-hydrates it supplies.

3. That nitrogenous substance may also serve as a source of fat, more especially when it is in excess, and the supply of available non-nitrogenous constituents is relatively defective.

The discussions of the American Dairymen's Association elicited the following facts: That the factory system to be successful must have branches, where the milk may be received and made into cheese, and thence taken to the central factory to be cured; that a mile and a half to two miles is as far as it will be found feasible to draw the milk; that the milk, to produce good flavored cheese, must be pure and sweet in the vat when the rennet is mixed with it; that the finest flavored cheeses, all other conditions being equal, are those which have the smallest amount of water in them; that improper modes of salting make porous cheese; that the quality of cheese depends somewhat upon the soil; that different localities produce cheese of widely different qualities; that, for the best milking stock, the only safe reliance is for one to raise his own calves, a bull of a reputable milking family being kept for the purpose, and that calves can be raised with better results as to cost and quality.

Whey butter.—Excellent butter, fit for the table, is said to have been made from whey, and sold in the New York market at the highest prices One of the processes of making it, given by a member from Lewis county, is as follows:

After separating the whey from the curd, place it in a tin vat and add a liquid acid; one gallon to the whey of 50 gallons of milk if the whey is sweet, but less quantity if changed. After this apply heat until it indicates a temperature of from 200 to 212 degrees Fahrenheit. When the cream rises and is skimmed off and placed in a cool place, let it stand till the next day. Then it is churned at a temperature ranging from 56 to 63 degrees, depending on the weather: and it is worked over and salted in the usual manner of butter making. It will produce, on an average, one pound of butter from the whey of 150 pounds of milk. The acid

is made by taking any quantity of whey at boiling heat after the cream is extracted, adding one gallon of strictly sour whey to ten gallons of this boiling whey, when all the caseine remaining in the whey is collected together in one mass and is skimmed off. After the whey is allowed to stand from 24 to 48 hours, it is ready for use as acid. This process is repeated as often as necessity requires.

The foregoing may be called the heating process of making whey butter; the following is another mode, which may be denominated the cooling process:

Take a vessel made of zinc, or at least with a zinc bottom, about 15 inches high, three feet wide, and as long as desired; set the vessel in cold water, and put in the whey; put in a handful of salt to every ten gallons of whey. During the first ten hours stir it up thoroughly from the bottom every 15 minutes; afterwards let it stand quiet for about 20 hours, and then skim it. Then churn the cream, keeping it at about the temperature of 58 degrees Fahrenheit. If above 60 degrees, cool it; if below 56 degrees, warm it Churn it until the butter becomes granulated about the size of the kernels of buckwheat. Let it stand about five minutes, then let the buttermilk run off; then throw on cold water. If not hard enough, let it stand until it becomes so before it is stirred much. Then rinse with cold water until the water runs off clear. Then churn together, or "gather it," press the water out; salt it, one pound to eighteen, and let it stand until the next day; then work it until it all becomes perfectly even in color. Pack it as other butter.

Seeding lands.—The following combination of grasses was recommended to be sown for the purposes named:

For hay, sow redtop, timothy, June or blue grass, orchard grass, tall fescue, smooth-stalked meadow grass, and foul meadow grass.

For pastures, red and white clover, orchard grass, timothy, sweet-scented vernal grass, meadow fox tail, June or blue grass, and smooth-stalked meadow grass.

For pastures on moist land, June grass, redtop, tall fescue, orchard grass, rough-stalked meadow grass, and floating fescue.

For pastures and meadows on wet clay soil, redtop, couch or twitch grass, quack, June grass, and rough-stalked meadow grass.

For soiling, lucern, winter rye, medium red clover, tall oat grass, and millet.

For exhausted wet clay soils, couch grass and quack, which are both propagated from the root as well as the seeds, strong and hardy growers, and when once fixed in the soil remain there. Quack produces better hay than timothy for cattle.

Best grain for stock.—It was asserted from experience that the best grain for feeding dairy stock, all things considered, is: 1st, oats, well ground; 2d, rye; 3d, barley; 4th, wheat; 5th, bran; 6th, buckwheat; 7th, corn and oil-cake, equal to either. What is left of buckwheat after taking out the flour will largely increase the quantity of milk, without improving its quality, or the condition of the cow.

An English article on cross-breeding of cattle is worthy a place in the report, and would be of great benefit to those who have the facilities for crossing with the families of the cattle mentioned, which are possessed by too few of our farmers.

The eleventh annual report on the noxious, the beneficial, and other insects of the State, by Asa Fitch, M. D., occupies 57 pages. It is to be regretted that every State in the Union has not made provision for such extensive and valuable researches as are presented annually by the New York State entomologist.

From the reports of the district and county associations and clubs, the following items are worthy of attention: The total receipts of 30 county societies for the year were $105,058 64; and the expenditures $93,550 74; there being 20 societies which did not report either receipts or disbursements. The nineteen clubs and associations reporting received, during the year, $23,918 34, and expended $22,998 40, making the total receipts by all the societies, excepting the State society, $128,976 98; and the total expenditures, $116,549 14. By inciting cows to drink water freely, they produce a greater quantity of milk, the report referring to a communication to the French Academy of Sciences, and recommending experiments. Well-ripened straw fed to milch cows does

not produce milk at a profit; but straw cut in a green condition compares favorably for feeding purposes with clover and timothy hay. It does not pay to raise roots extensively for cattle feeding, principally because of the high price of labor, One head a day, in the month of November, of the Marblehead cow cabbage, will be sufficient, with what feed can be picked up in the fields, to produce a great flow of milk.

One hundred and ninety-eight pages of the report are occupied with the details of the trials of mowers, reapers, and some other agricultural implements in the field at Auburn, New York. The report is very interesting, and valuable in many respects, especially as affording one of the best models for conducting such trials.

The report concludes with nearly 200 pages of agricultural statistics of the State for 1865, in which appear the following statements:

The whole number of acres improved, 14,827,437; unimproved, 10,411,863; divided into 242,436 farms, valued at $920,349,331. Cash value of the stock of the State, $127,072,554. Quantity of wheat raised in 1865 nearly 3,000,000 bushels less than in 1855. Average yield per acre of wheat in 1865, 11.41 bushels. In 133 cheese factories, an average of a fraction less than 10 pounds of milk made one pound of cheese. Average yield of milk per cow, (67,034 cows,) 2,802 pounds; pounds of cheese produced per cow, 283; average value of yield per cow, $56 60.

OHIO.

The twenty-first annual report of the Ohio State board of agriculture to the general assembly of Ohio, for the year 1866, is a well filled and neatly printed volume of 736 pages.

The State fair for 1866, which was the 17th fair of the society, was held at the city of Dayton, and is reported to have been more successful in every respect than any that preceded it. The number of persons in attendance during the four days of the fair is stated to have been 71,000; and the receipts from all sources, $16,600. The amount paid for premiums and other expenditures is not given. The total number of entries appears to have been 2,732, divided as follows: Horses, 249; jacks and mules, 8; cattle, 156; sheep, 195; wool, 6; Cashmere goats, 2; swine, 87; poultry, 175; machinery, 346; tools and household implements, 125; ploughs, 80; sewing machines, 16; mill fabrics, 22; fancy needle-work, 162; household fabrics, 43; worked metals, 50; stoves, castings, &c., 40; cabinet work, 16; wooden ware, 6; saddlery and shoemakers' work, 88; crockery, &c., 10; farm products, 30; butter and bread, 59; honey, preserves, pickles, &c., 173; sugar, syrups, &c., 12; vegetables, roots, &c., 272; flowers, 91; apples, 79; grapes, 14; peaches, pears, &c., 19; drawings, paintings, &c., 90; sculpture, 2; musical instruments, 16.

County and district societies.—Seventy-six report their officers, and all, except one, held fairs during the year; gross receipts of 68 were $146,844 88, and the gross expenditures $140,862 57; the total membership of 52 societies is reported to be 23,452; the total number of entries of 23 societies was 19,843; and 69 report in detail the condition of their societies, some of which are very brief, but most of them full and satisfactory, and in almost every instance represent the societies to be in a flourishing condition and the fair exhibitions the best ever held, notwithstanding the discouragement of short crops, on account of unpropitious weather, in wheat and other cereals. The following recommendations are made in one of the reports from county societies, as based upon satisfactory experience: Ground for spring wheat should be prepared for the seed the fall previous to sowing, and the seed should be sown so early in the spring as to subject it to one good freeze, as it is believed that it partakes of the nature of winter wheat in this respect; also, that wheat should not be sown oftener than

once in three years on the same ground, and then when the land has been two years in clover, and that it is considered bad farming to have wheat and corn follow each other.

Following the reports of the county agricultural societies, is the statement of farm crops:

Wheat.—One statement gives the cost at nearly 43 cents per bushel, which sold for \$2 40; another, the cost at nearly 70 cents per bushel. Of the three reports of yield, one gives 20 bushels and 7½ pounds to the acre; another 19 bushels and 38 pounds, and the other 34 bushels. In the last report, the "Tappahannock" is named as the only variety that ripened side by side with the white Mediterranean, the former ripening in June, and yielding 12 quarts for one sown.

Corn.—The largest crop reported was in Lorain county, stated to be 120 bushels to the acre. It was on bottom land which had been pastured four or five years, and on which corn had been raised the previous year without manure. For this crop, it was plowed April 19, harrowed May 14, planted May 15, without manure, with small yellow gourd seed, three and one-half feet each way, cultivated three times, hoed twice, and cut up September 24.

Sorghum.—One statement gives the profit on one-fourth of an acre as \$30 70.

Potatoes.—A profit of \$124 80 is reported from 81¼ rods of land; and from one-fourth of an acre, \$28 20.

In the report of the secretary on the "condition of agriculture," in the State, Mr. Klippart says that, "in the present condition of agriculture it may safely be stated that cattle are the basis of agriculture," and that "cattle have always received more attention from the farmers of Ohio than horses or mules;" and then goes on to make "a complete analysis of the problem throughout its entire extent," embraced in an article of about 34 pages, in which there is much profitable matter on the feeding and keeping of cattle. The writer says:

> I have seen stables in Europe so conveniently arranged that one man can take just as good care, in every respect, of three times the number of animals that he could here in Ohio in the ordinary stables. Suppose one is about to engage in breeding or rearing cattle; is it not cheaper to spend \$3,000 in purchasing and arranging convenient and appropriate apparatus, and hire *one* man, than to dispense with the conveniences and hire three men? The cost of one man, at \$300 per annum, with these conveniences for ten years, would amount to \$6.000; the wages of three, at the same rate for the same time, without the conveniences, would be \$9,000.

In another part of the volume is an article on stall-feeding cattle in England, where a great improvement has been effected by the use of the turnip in the supply of animal food. To secure a spring supply of fat cattle, stall-feeding on turnips principally has been found beneficial and profitable, and is considered one of the most important features of modern husbandry. With good management it is scarcely possible of late years to lose by stall-feeding, if the animals have been properly selected and have been kept free from disease during the time they are tied up. The writer lays considerable stress upon the necessity of the selection of well-bred stock for stall-feeding purposes, and among those mentioned as best fitted for that purpose are the Short-horn, Hereford, and Devon. These, with their crosses, are the best races for taking on flesh and fat. In the selection of individual animals for stall-feeding, those that have the hair curling and wavy are recommended as being generally of a good, sound constitution, hearty feeders, and seldom failing to do well. When tied up in the stall for early maturity well-bred heifers are best, as having a greater tendency than bullocks to take on flesh; it is difficult to finish bullocks at an earlier age than three years. "It may be taken as an axiom that the larger the bone and frame of the animals tied up to fatten, so much the better prospect have they of paying for the food they consume, attendance, &c." Proper feeding boxes, ventilation, warmth, and conduits for the urine, are absolutely necessary for health, and cannot be overlooked. The month of October is generally observed for removing the cattle intended for winter feeding from the grass to the stalls, tur-

nips being given on the grass for the purpose of accustoming them to the alteration of food before having to depend entirely upon it. Most stall-fed cattle are turned out after three or four months' feeding. It is good management to have a lot of fat beasts ready for sale in January and February, when such cattle are generally very scarce and prices range high. No man should sell his cattle unless they are thoroughly finished; if he does, it is done at a loss. The most largely used food for winter feeding is the turnip, a root admirably suited for the food of cattle. Next in importance is the mangold, and it has fewer diseases than the turnip. While potatoes, parsnips, and carrots form nourishing food for cattle, they are seldom grown for the express purpose. Turnips and mangolds are always relied upon as the leading article of food for fattening cattle in Great Britain. Hay, and sometimes sweet fresh straw, are used in addition, to give variety and to correct the watery nature of the roots. Highly concentrated food, such as oil-cake and meal, are now sometimes mixed with the pulp of turnips, which mixture is much relished by the cattle, and they thrive on it with extraordinary rapidity; but the best of anything must be used, or the expenditure and trouble will be lost. No benefit is derived from cooking the turnips. Good beds for the cattle and comfortable stalls, good feed and plenty of it, with perfect cleanliness and decent ventilation, are the great requisites for producing good beef in paying quantities. On the cattle and cattle trade of the west William Renick, esq., of Circleville, Ohio, presents a very interesting and profitable article. He gives a brief history of the feeding of cattle for market in Ohio, running back over a period of 50 years, and states that so long as corn was cheap it paid well; but for the last 10 years fattening cattle for the eastern market has fallen off, and they are not so heavy nor so fat as formerly. He questions whether the business can be profitably carried on as a leading one with the farmer in any locality, possessing other ordinary moderate resources, when the farming population of that locality exceeds 50 inhabitants to the square mile. In localities favorably situated for the sale of corn, the business of feeding it to cattle has become a comparatively unimportant one. The application is made to those cattle made fat, or mostly so, on corn. There are not fewer cattle fed in Ohio now than there were 10 or 15 years ago, but grass is more relied upon to fatten for market; nor is there the same occasion to fatten as formerly since the introduction of railroads. Hence the deduction that the prairie States, with their extensive grass ranges and railroad facilities, can feed and fatten cattle cheaper than it can be done in Ohio.

The first introduction of English cattle into the west was made about the year 1794, by Matthew Patton, who obtained his stock from Mr. Goff, of Maryland, in 1783. A Mr. Miller, of Maryland, also imported some about 1790, and both the Patton and Miller stocks were of large size and the cows good milkers. In 1817 the short-horns were introduced, and some long-horns also. The short-horns proved a valuable acquisition, although the quality of the beef was no better than that of the Patton and the Miller stocks. It was not until 1832 to 1836 that a general interest in the improvement of cattle was manifested, when frequent importations were made by breeders in Kentucky and Ohio. "Their present management and their crosses, by hurrying them off to market at the early age of three years, involves an absolute waste; because if they were kept one year longer and made ripe for the shambles, there would not only be a gain of full one-third in weight, but they would produce a quality of beef not excelled in any country or clime." This fact should command the attention of cattle-dealers. The remainder of the article treats principally on the introduction of large numbers of cattle from Texas, which involves large losses, not only to purchasers, but also spreading a disease fatal to the cattle in the districts through which they are driven.

Cheese and cheese factories.—The secretary's report contains interesting tables in regard to the production of cheese, made up from information obtained from

52 cheese factories, located in 10 of the leading cheese-making counties, all of which are in the "Western Reserve," on Lake Erie. These factories report 37,050 cows attached to them. In 1865 there were reported 15,798,210 pounds of cheese made in these counties, the whole amount made in the State being only 16,940,210 pounds. An address of Mr. Anson Bartlett, of Lake county, before the Cheese Manufacturers' Association, on "The Past, Present, and Future of Cheese-making," contains many reliable suggestions on this subject. At a meeting of this association it was resolved unanimously that tin pails should be used for milking purposes, and by the same unanimity that the calf to be killed for the rennet should be at least six days old, and be killed some 20 to 24 hours after sucking; much salt in curing should be avoided, and rennets should not be used until six months old.

Sheep and swine—An increase is shown in the number of sheep since 1865 of 366,232; but a decrease in value of $2,000,000. Of swine the increase from 1865 is 344,325, and the increased value in the same period $2,160,255. The reports in detail of about 30 sheep-shearings in the State exhibit a remarkable number of very large fleeces, and give strong evidence that the wool-growers of Ohio are advancing rapidly to as great perfection as is possible in producing good wool and large fleeces.

Sub-soil drainage and drill culture.—An address in Knox county says, "There is, perhaps, scarcely a farm in this county containing 100 acres which has not on it wet, marshy, spongy, swampy places, that would richly pay the owner to dry up by tilling; while there are whole fields, on some farms, of rich, low, wet, vegetable soil, which, once drained, would pay the whole expense in two or three crops." From the interest manifested in the reports from all parts of the State, and from the fact that there are 52 tile-drain manufactories reported in the State, it is probable that a great necessity exists for drainage generally, and that the farmers are pretty well awakened to the importance of draining their lands. Recent experience in this country and Europe of the benefits of drill culture is given, from which it appears very satisfactorily demonstrated that grain put in with drills will cause a more certain and larger yield, and of better quality, as compared with broadcast sowing, and with a saving of about one-third of the seed.

Thick sowing and thin sowing.—An article by an English farmer presents a large number of facts, obtained by an extensive correspondence with farmers in England who have tested the thick and the thin sowing of wheat during the previous years. The testimony is so strongly in favor of thin sowing that it appears wonderful that English farmers have not adopted the system generally. The requisitions are that the land shall be in the best of tilth, the seed of the best character, and the variety pure; also that it be planted so as to give each seed one foot square of soil. It appears from the experiments mentioned that the more grains sown the fewer the number of ears to each grain per acre. By special culture of small spots, a crop at the rate of 108 bushels per acre has been produced, and another of 162 bushels per acre. The general yield is stated to be at least doubled by thin sowing. By thin sowing it must be understood that but one seed was dropped in a place. There is an excellent recommendation that every farmer have a plot of ground set apart to secure pure seed. In this case the seed must not only be selected, but carefully picked over by hand, rejecting all defective or imperfect grains, and retaining only those which by their fulness show their healthy, vigorous constitution. Another plan is to select the finest heads of the variety desired from the fields before cutting. If farmers will not do this for themselves they should purchase from those who make a specialty of raising seed grain. The writer predicts the increased dependence of England upon foreign countries for the staff of life, if some such improved system of raising wheat is not pursued. If England is failing in this

regard, where do we stand, when our crops do not average more than half those of England?

A paper written by J. J. Mechi, of Tiptree, England, says that the thick sowing of grain is a great national calamity; that more crops fail to yield well from too much seed sown than from too little manure. He adds:

Liebig justly says that the greatest enemy to a wheat plant is another wheat plant, for the very obvious reason that both require the same food; small heads and kernels, and weak, flabby straw, are the natural consequences of this competition. For several years I tried one bushel of wheat per acre against two bushels per acre, both drilled. The difference in favor of the one bushel was equal to a rent of 30*s.* ($7 50) per acre.

The potato and the cause of the potato rot.—These subjects are embraced in two papers. In the first there is this assertion: "The best and most profitable seed is the medium size, smooth, and well-developed tubers;" while in the second it is said that "when the small potatoes alone were planted in Germany they were entirely exempt from the rot; but if the large ones were planted the rot would appear every wet season." It is further asserted, from experience, that those varieties, the flesh of which is of a single, uniform color, either white or yellow, are the least liable to be affected by the rot.

The exhaustion of soils.—This paper, translated from the French, starts out with the historical fact that the exhaustion of soils depopulates the land; and gives several prominent instances to prove the proposition. The different modes practiced, and the article used to restore the fertility of the land, from the earliest recorded history of agricultural manipulations of lands to the present day, are given; and the article concludes with the proposition that as all artificial manures will, in no great period of time, be exhausted, the excrements of animals, which derive their sustenance from the soil, both human and brute, must be resorted to, to keep up the necessary producing standard. In the tables connected with this article it is stated that it has been demonstrated, by accurate observation, that about one-half, by weight, of all the dry matter (absolutely free from water) consumed as food is deposited in the form of dung of animals. Stable manure resting until heated loses 20 per cent., and is reduced gradually at last to 50 per cent. of its original value.

Wool comparisons.—An exhaustive article on the subject of the quality of wool produced on the globe occupies 33 pages of the report. It is a translation by Mr. Elsner, of Silesia, in which the fineness, loss per cent. in washing, market prices, &c., in every stage of condition of the wools of the world are given. It also contains a description of the different families of sheep, and the different qualities and length of staple of their wools as affected by climate. It is stated that in the humid climate of England longer staples of wool are produced than on the same sheep in dry climates. The best representation of nice combing wool is the Lincolnshire sheep, and it is one of the largest sheep races in England. The next in rank for a long wooled sheep, in England, is the Leicester, which is the most generally distributed combing wool race of that country. It is also the most tender of the large English races, and its early maturity and great fattening propensity are its chief qualities. The third in rank of combing wools are the Cotswolds, which are a vigorous and hardy race. The Southdowns are the most important race of England. The article is very interesting to the wool grower.

Products of the State.—In a paper on the products of Ohio appears the following statements: That there are not less than 256 establishments in the State, devoted to the manufacture of agricultural implements and machinery, exhibiting the best evidences of the permanent prosperity which Ohio has secured to herself, and that a very rapid advancement has been made in the culture of the grape and in the manufacture of wines. The character of the soil required for the grape, and the best mode of managing vineyards, all based on the experience of growers of the grape, illustrated by engravings on the subject, are the subjects of an article of importance to grape growers.

The report of the Ohio Pomological Society occupies 64 pages, and the discussions in regard to the best varieties of fruits, remedies, experiments, &c., possess much of interest to the fruit grower.

An address on "European and American agriculture," by John H. Klippart, secretary of the board, occupies 22 pages. Mr. K. made a pretty thorough examination of the European system of agriculture on his recent visit to Europe, and presents many valuable facts in regard to what he saw there, which he compares with the systems of agriculture practiced in this country. He also describes the approved artificial stone, exhibited at the Exposition, and points out its advantages, and gives the mode in which buildings are constructed with it.

Papers on the gypsum beds of the State of Ohio, and the economy of the use of this mineral on the soil; on sugar, from the sorghum plants; rainfall and channels to the sea; on the wheat-exporting power of the United States; and on the soils of Ohio, contain much interesting matter.

The laws of the State for the encouragement of agriculture follow the report of the secretary, and may be found in every volume issued by this board—a practice worthy of imitation.

INDIANA.

There was no volume of the transactions of the "Indiana State Board of Agriculture" published for 1866. The one before us is the ninth report of the board for the years 1862 to 1867, inclusive, with an abstract of the reports of county societies for 1867. It contains 697 pages. More than half the volume is appropriated to the proceedings of the State society and board, principally on its own business, awards of premiums, and the constitution of the society, which was adopted in 1860. The society owns ample grounds near Indianapolis, for exhibitions, for which purpose they are reported to be well fitted up. The 14th annual State fair was held at Indianapolis on the 2d, 3d, 4th, and 5th days of October, 1866. The aggregate amount paid for premiums was $3,488, divided as follows: For live-stock, $2,132; agricultural, $174; fruit, wines, and flowers, $325; mechanical, $272, and 42 diplomas, 2 gold medals, 7 silver medals, and 6 bronze medals; domestic manufactures, $155, and 1 silver medal; needle-work, $177, and 2 diplomas; butter, cheese, honey, bread, &c., $121, and two silver cups; paintings and pictures, $84; scientific and musical instruments, $48, 4 diplomas and 2 bronze medals. The reports on the working machinery on the ground are very full and satisfactory.

The premium for best wheat was awarded for an acre of red wheat yielding 26 bushels, being the average of 13 acres, at an average cost of $6 75 per acre; and for best corn, for a lot yielding 148 bushels and a fraction on one acre, from a field which averaged 121 bushels and a fraction per acre, at a cost of $7 per acre.

The committee of awards on Cashmere goats strongly recommend the raising of this class of animals, because they are found to be very profitable in Indiana.

The committee of awards on fruits highly commend Indiana as a good fruit-growing State. but deprecate the losses arising from deception by those from whom the farmers purchase their trees, &c.

There are 21 reports from as many county agricultural societies, which state that there is a continued advance in agricultural improvement.

The societies generally own the ground on which they hold their fairs, and they are free from debt. The aggregate number of entries for exhibition, &c., in 1867, was 11,127, and the total amount paid for premiums, $20,930; gross receipts, $35,187.

About 200 pages of the report (the appendix) are devoted principally to addresses and short essays, under the following titles: Breeding and raising of cattle, and management of milch cows; deep ploughing; under-draining and grasses; description of Putnam county; drift formation in Fulton county; mineral

resources of Indiana; and the reports of the commissioners to the Paris Exposition, the latter occupying about half of the appendix.

From these several papers the following statements are abstracted: That nearly the whole State of Indiana is a heavy drift formation, to a depth of from 10 to 100 feet; that the mineral resources of Indiana, so far as have been examined, exhibit a deposit of coal, principally in the counties of Orange, Lawrence, Monroe, Owen, Putnam, Parke, Fountain, and Warren, equal to 10 feet in thickness, covering 8,000 square miles; of iron, a considerable quantity of bog ore, containing from 30 to 40 per cent. of iron, and easily reduced; and of stone, excellent for building purposes, distributed over the State. Salt has been manufactured in the State, but it is a question whether it can be done now economically. Deep ploughing and under-draining of the lands are strongly urged; the profits of grazing a good, thrifty, common steer in Putnam county are usually estimated at about $20 during the spring, summer, and autumn; that during the month of May three steers gave a gain of 420 pounds; June, 325 pounds; July, 145 pounds; and August, only 60 pounds. The profits of cattle-grazing are inducing many to raise and feed cattle, to the great advantage also of the land. Good crops of wheat are not raised because the lands are not manured.

MICHIGAN.

The volume under review contains 400 pages, 322 of which are occupied by the "Fifth annual report of the secretary of the State Board of Agriculture," for the year 1866, the "Register of meteorological observations for 1865," and the "State laws relating to agriculture."

In the secretary's summary of the operations on the State college farm, he says: After several years' trial, preference is given to the Golden Ball turnip for early feeding, and to Skirving's Swede turnip, and Yellow Globe mangel-wurzel, for winter and early spring feeding. The root crop is considered by him an important one in stock feeding. The Short-horn, Devon, Galloway, and Ayrshire cattle, with their crosses, are bred on the farm. Of the Galloways, experience thus far supports the opinion that this will be a very useful breed for that State. Of sheep, the Merinos, Silesian Merinos, Southdowns, Cotswolds, and Scotch black-faced are bred on the farm. The fleeces of a ram and ewe of the Cotswold averaged over 16 pounds each, worth 50 cents per pound. Of hogs, the Essex, Suffolk, and Chester county breeds are specially mentioned. The Essex is held in high estimation wherever it has been proved. The value of the farm products for the year was $5,125 16, and the expenditures $2,532 93, showing a profit of $2,592 23. The new Peach-Blow potato proves to be valuable both for quality and productiveness. Beans and potatoes were cultivated in the orchard for the benefit of the trees. In connection with this fact, it is stated that the trees produced no fruit. Several hundred of the Norway spruce and the arbor vitæ were set out for the protection of fruit trees from the high winds. The receipts from the productive branches of the horticultural department were $10 29 in excess of expenses.

The report of the treasurer follows that of the secretary, in which all the receipts and expenditures of the college and farm are given in detail. The estimates of expenditures for the next two years amount to $44,318 16.

In the report on experiments in practical agriculture are found the following: In the application of manures to lands, horse manures have proved the most valuable, cow manure next, and nearly equal. One of the conclusions asserts that "it is difficult to obtain a reliable standard of comparison by which the results of field experiments may be tested." In feeding pigs on milk it was found that to produce one pound of live weight the first week after birth, 7.20 pounds of milk were required; 7.92 pounds in second week; 11.81 pounds in third week; and 10.13 pounds in fourth week; average for four weeks, 9.25 pounds.

In consequence of a very unfavorable season the wheat crop in 1866 was considerably below the average, and clover was nearly as badly injured as wheat; oats and barley gave a fair yield; Indian corn was greatly damaged by frost; potatoes, one of the most important crops of the State, were successful and of excellent quality, especially in the sandy soils; apples throughout the State averaged only a small yield; peaches generally failed, except along the lake shores; grapes did not generally succeed so well as in 1865, except in some favored localities.

Under the head of "New crops in the State," sorghum and its products are included. The amount of sorghum molasses made in 1866 is stated to be 800,000 gallons, and the sorghum interest is fast increasing. The hop is also named as one of the new crops. Its cultivation in Michigan has been followed with varied success, the profits generally satisfactory; the climate of the State seems well adapted to its growth, and the average crop is estimated to be not less than 1,000 pounds per acre, and the average price 35 cents. An experienced hop-grower says that the principal requisites for the growth of the hop are a dry, sandy, or gravelly soil made rich by barn-yard manure, and a proper protection from the winds. An article is introduced from an English hop-grower, which gives a brief but very comprehensive description of the manner of raising and preparing hops for market in England. This is followed by an article on hop-houses and hop-boxes, illustrated by cuts, by a hop-grower in Wisconsin.

In regard to the rotation of crops, a lecture delivered in Scotland, republished in this volume, contains much valuable matter. The lecturer says, although rotation is admitted to be highly beneficial as at present practiced, yet no satisfactory explanation has been discovered for the results. The Romans had some idea of it, not very different from that at present entertained. The lecturer recommends continued and minute observations of all facts likely to throw light upon it.

On the subject of "the factory system of cheese-making," the secretary mentions, as a gratifying fact, that the making of cheese by this system has been commenced in Michigan. He gives the statement of a correspondent who has a factory which uses the milk from 230 cows. He says that, to make factories profitable, the milk of at least 400 cows should be used. He mentions three other factories in Michigan, which probably make up the whole number in the State. The article is chiefly occupied with an address on the principles of cheese-making, by X. A. Willard, of New York, the author of an article more in detail, published in the report of this Department for 1866, in which he asserts that "no branch of farming offers a prospect of better or more permanent remuneration than the dairy."

Premium farms.—The committee appointed by the State Agricultural Society to examine the farms entered for premiums, state that there were six entered, which were visited in the order named below.

The first, located in Oakland county, 22 miles from Detroit, the principal market for the produce of the farm; the only means of reaching the city being a good turnpike road. It contained 160 acres, 130 of which were improved and under cultivation, 30 acres being a wood lot. Two thousand rods of drain tile were laid on the farm, not less than three feet below the surface. The farm was stocked with 9 horses, 11 head of cattle, 6 milch cows, and 1 bull; the rule being to keep one good milch cow for every two persons in the family; 130 sheep, or one for every acre of improved land; and 10 swine, all the animals being of the best crosses. The system pursued was mixed husbandry, there being, in 1866, 16 acres in wheat, 20 acres in corn, 15 acres in potatoes, 20 acres in hay, and 50 acres in pasture. The wheat and potatoes were the only crops sold; the manure pile was strictly attended to; no feeding crop was sold; the amount paid for labor was $260; after supporting a family of 10 persons, each

improved acre brought in a return of $22 59½, which the committee report as a remarkable result in strictly legitimate farming.

The second, in Shiawassee county, 18 miles from a market, contained 220 acres, 150 of which were under cultivation. Of stock there were 300 sheep, and 22 horses, cows, &c. Of crops, 40 acres of wheat, 7 acres of corn, 8 acres of peas, 6 acres of oats, 40 acres of hay, and 80 acres in pasture. There was also pasturage for 150 more sheep during the season. Amount paid for labor, $190. The farm supports a family of 13 persons, and the improved land returns $12 33 per acre.

The third, in Clinton county, 15 miles from St. John's, contained 280 acres, 220 of which were under cultivation, with not half an acre of waste land on the place. The live stock consisted of 11 horses, 6 of which were kept for work, 6 milch cows, a yoke of oxen, 6 two-year olds and 4 yearlings, and 6 swine Wheat is the main money crop. The crops of the year were 50 acres of wheat, averaging 20 bushels per acre; 18 acres of corn, 10 acres of oats, 40 acres of hay, 70 acres in pasture, and 10 acres in clover seed. The farm supports a family of 6 persons; paid out for labor about $450; income per improved acre, $9 50.

The fourth, in Hillsdale county, contained 220 acres, 40 of which were in timber. It had 1,260 rods of under-drain, which cost, on an average, 75 cents per rod. The live stock consisted of 9 horses, 5 of which were kept for work, the remainder young stock; 5 milch cows, 7 three year old steers, 6 yearlings and two-year olds, 5 sows and 30 pigs, and 370 sheep, including lambs. The main money products of this farm were wool and live stock. The family averaged 11 persons; amount paid for labor, $300; average income per acre of improved land, $16 50.

The fifth, in Kalamazoo county, embraced 360 acres, 340 improved and 20 in wood. The system on this farm made wheat and wool the leading money crops. It had 375 sheep, and 51 animals of all other kinds. The family averaged 9 persons, and the income was $14 30 per improved acre. This farm was awarded the first premium of $100.

The sixth, in Cass county, contained 110 acres, 80 of which were under cultivation, and 30 in timber. The live stock consisted of 80 animals, 50 of which were sheep. It had a nursery of fruit trees, containing 10 acres. The returns show an income of $29 60 for each improved acre, but about $7 58 should be deducted for the nursery, as not strictly belonging to agricultural industry. The fences were composed largely of the Virginia thorn, which the committee decided to be the best hedge they had seen in the State, and which the proprietor of the farm, after various experiments, considered superior to all other thorn hedges. Large and small fruits were extensively cultivated upon the farm. This farm was awarded the second premium of $75.

All the foregoing farms were highly commended for general good management and excellent arrangements and improvements. It will be seen, however, that the sheep farms gave the largest income.

County societies.—Thirty-seven pages are occupied with reports from county agricultural societies, which are generally interesting, and in some instances the specific details of the mode of cultivating, and the cost of, some of the leading crops, are of value to the farmers of the State. The number of county societies reporting is 19.

Animals, breeding, &c.—A valuable article on the "principles of breeding," by John S. Sebright, England, with practical comments by Sanford Howard, establishes the following facts: That judicious breeding in-and-in improves the animal in the points desired, if possessed by both male and female; that the mixing of two distinct breeds, however, with the view of uniting the valuable properties of both, is not approved; in reference to sheep, "experience has proved that the greatest quantity of yolk does not accompany the finest fleeces."

On the "precocity of development in animals," it is alleged that early maturity

may be attained, especially in cattle and sheep destined for the shambles. "Animals, like plants, that grow rapidly, are less firm in tissue and decay sooner than those of slow growth." The article, after discussing the several points presented in the forcing system, admits that while the breeders may be benefited by pursuing it, the purchasers, especially of those animals intended for use in any way, will be more or less the sufferers. The paper concludes with the hope "that the forcing system shall no longer exist under a false designation, that men shall not in future speak of the artificial induction of disease, of premature development, and of systematic degeneration, under the imposing terms, cultivation and improvement."

History and characteristics of the Devon breed of cattle.—In an article on this subject it is claimed that the antiquity of this stock, as a distinct family, is equal to that of any other breed. For the union of the important qualities, as milking, beef, and the yoke, it is superior to any other breed in this country. In Michigan, these cattle are equally valuable for beef and labor, but for milking they are inferior, and where dairying is pursued as a special business the secretary thinks the Devons will not be adopted. This differs from other information on that point.

Public sheep-shearings.—On what principles should they be conducted? This article, by the secretary, argues the inutility of sheep-shearings, as at present conducted, and makes some excellent suggestions in regard to points to be observed, to render competitive shearings useful.

Profits and management of poultry.—A member of the Royal Agricultural College, in treating upon this subject, gives some very useful information in regard to the rearing of poultry, especially chickens, from which are abstracted the following points: Two cocks with eight hens in separate yards for breeding; for eggs only the proportion of sexes is immaterial; the hen continues for two, and almost three years, in the best state for breeding; the fresher the egg the better for breeding; to promote laying, give bones and scraps of cooked meat; separate the broods to preserve health, choosing safe and sunny places for the coops; mate one gander with not more than three geese. The article closes with treatments for the diseases to which chickens are subject.

Injurious insects.—We find the following approved remedies against the ravages of the canker-worm. A strip of sheep-skin with the wool on, fastened as a belt around the tree, has been found very effective. It should be put around the trees early in November. It should not be less than two inches in width, and the wool should be three-fourths of an inch to an inch in length. Great care should be taken that no space be left through which the insect can pass. Experience has proved that the remedy is perfect when properly applied. As spiders form their webs in all directions, care should be taken to destroy everything that will permit a communication from below the protector and over it to the tree, as the moths will pass along upon the webs about as readily as if there were no protection there. Other modes of protection may be as efficacious, if the same care and attention are observed; but it is an object to get a protection that will prove effectual with the least expenditure of time, money, and labor. It is recommended to destroy all the trees that have become defoliated by this worm, as they will not bear fruit again. [?] After their removal the younger trees can be more easily managed, to all of which the sheep-skin belts should be applied.

The white grub.—In its perfect state this larva is called the May-bug or May-beetle, and closely resembles the European cockchafer. In the latter part of July and in August the grubs are very numerous in old meadows and pastures. Attention is drawn to them by spots of sward becoming dead, as if killed by drought. On turning up some of the dead turf the grass roots are found to be eaten off an inch or two below the surface, permitting the turf to be rolled up like a carpet. They carefully reject every root of clover. It is known, however,

that they eat the roots of young fruit-trees, and sometimes do great injury to strawberry-plants, Indian corn, wheat, and potatoes. In all States they are preyed upon by various animals. No doubt an immense number might be destroyed by turning hogs into the fields where the grass has been killed "Where the ground has been overrun by the grubs it is frequently advisable to plough it, and either sow it to winter wheat or rye, or reseed it to grass." As the larva of the insect, at the approach of winter, descends into the ground to a greater depth than can be easily reached by the plough it cannot be thus turned up to be killed by the frost late in the fall.

Preservation of forests, &c.—A long discussion took place at one of the meetings of the board in regard to the destruction of forest trees in Michigan, which it is stated, if not soon arrested, will prove a serious loss to the State in the want of shelter to crops, fruit trees, &c. The influences of climate, rainfall, winds, &c., on the productions of the State, were also discussed, and a memorial to the legislature was considered, urging the necessity of legislation for checking the evil referred to, and encouraging the planting of forest trees for shelter, &c.

The report also contains an article on "Improved agricultural implements," and one on the "Fruits along the eastern shore of Lake Michigan," relating principally to the peach orchards, showing that the peach, as well as the grape and other fruits, has been a source of great profit to the producers; besides, it embraces 24 pages of tables of the meterological observations, taken at the State Agricultural College, closing with the laws of the State relating to agriculture.

IOWA.

The report of the secretary of the Iowa State Agricultural Society for 1866 opens with congratulations upon the steady advancement of the products and improvements of the State, especially the growing of timber, in which a very general interest is manifest. He states that, in 1863, one acre to every 572 acres of land enclosed was planted in timber trees, which was increased in 1865 to one acre to every 260 acres of enclosed land. It is also stated that one-third of all the wheat sent to Chicago in 1866 was the product of Iowa. The number of county societies reporting in 1866 was 40, the aggregate membership of which was 9,270, and the amount of receipts $20,248. If some five or six more of the largest societies had reported, the aggregate membership would have been 12,000, and the receipts fully $35,000; and adding the receipts of the State society the total amount would be $41,460.

The thirteenth annual fair was held at Burlington, at which the number of entries was 1,334, being more than in any previous year, although there never had been a season so unpropitious, rain falling every day. These entries were divided as follows: Cattle, 79; horses, 176; mules, 30; sheep, 159; swine, 27; agricultural implements, 205; farm products, 139; other classes, 519. To exhibit the rapidly growing commerce of the State, tabular statements are given of the carrying trade of every railroad in the State, imports and exports. At the winter meetings of the society the reports of committees on essays, field crops, &c., were received, from which are abstracted the following important facts for general information, especially for the northwest:

Sorghum sirup and sorghum sugar.—The leading points in the statements accompanying the specimens of the ten gallons of sorghum sirup which received the first premium are, that it was made from two varieties of cane, the early sorghum and the Liberian, on the 20th of September, in Cook's rocker evaporator, without chemicals. The statement accompanying the sirup receiving the second premium is as follows:

The sorghum was raised on high, rolling prairie, the frost killing about half the leaves on the 21st of September, before the seeds were ripe enough to change color; but it stood till

the seeds turned brown, and was then cut and hauled to the mill. The cane was crushed in an iron mill, and boiled in one of Clark & Utter's railway evaporators, with cast-iron pan to finish in, and with no extra clarifying except to skim well.

For sugar.—The party receiving the first premium gave the following as his mode of making it:

Strip, cut, and work up the cane the same day, if possible. I take the sorghum *(Otaheitan)* when just fairly in bloom. In no case do I allow the seed to mature when I wish to make sugar; but for No. 1 sirup I let the seed mature. For sugar, I boil the sirup very heavy and rapidly; desiccate thoroughly and cool quickly. I use the Cook evaporator. When the sirup is reduced sufficiently I run it through a cooler made as follows: A tin pipe six feet long, two inches in diameter, immersed in a box of cold water; at the receiving end is a funnel turned up at right angles with the main pipe. The sirup, when passed through the pipe, is cool enough to be run into a barrel, where I leave it to granulate; set the barrels on end, and remove the top head, and, if possible, keep the room at about 70° to 80°. When sufficiently granulated, mix a little water with the mush sugar, and drain the mush with Hunts's centrifugal sugar drainer.

From the reports received from nearly every section of the the State it appears that the "Chinese," first introduced into the State from the Patent Office, makes the best sirup when the seed is pure; and that any of the leading varieties, not corrupted by hybridizing with broom-corn, will do very well if properly manufactured; that the black Imphee is preferred in the northern counties, because it ripens early; that no chemicals are used; that ripe cane makes the best sirup; that no sugar is made worth mentioning; that the product per acre averages 100 gallons; that it sells at an average of 70 cents per gallon; that high, rolling prairie produces the best crops for making sirup; and that the sorghum is not grown to the same extent as in former years.

Grain.—The committee state that circulars of interrogation were sent to 100 counties, in regard to wheat, corn, rye, oats, buckwheat, and barley; and that but ten counties reported, from which we gather the following: That the product of wheat averages 14 bushels per acre; the China Tea and Scotch Fife varieties, being the most cultivated, sold at an average of $1 25 per bushel at home; that the crop is not generally so profitable as corn, but this year equally so; subsoiling, draining, and drilling are but little practiced; upland clay soil best adapted to wheat culture; "Seed sown on corn stubble," says one of the reports, the others not responding to that question. That the product of corn averages 47 bushels per acre; the average of extraordinary crops, 95 bushels per acre; average cost of raising an acre of corn, when properly cultivated, $6; fall and spring ploughing produce the best crops, and manuring pays well, although little practiced; the crop is generally fed to stock, both on and off the ear. Rye is raised to a very small extent, not being considered so profitable as other crops. Oats are considered a fair paying crop, but not equal to corn; the product per acre averages 40 bushels; they are usually sown upon corn-stubble ground and harrowed in; the varieties generally grown are the Black and the White, and the Poland, where grown, give excellent satisfaction. But little buckwheat is raised, some considering it no better than a weed, others that the crop is too uncertain, &c. Barley is not raised to much extent; 40 bushels is considered a fair yield.

Root-crops.—Of the root-crops for which premiums were paid, 280 bushels of potatoes were raised, at a cost of $14 per acre, in the following manner: "Rich prairie soil, lying to the southwest, ploughed deep the 12th of May, well harrowed, and drawn off in hills, 3 feet apart; planted nine bushels of Peach Blows per acre, two pieces in a hill; covered with a hoe; cultivated once; double shovelled twice, and ploughed between them once." An average of 1,496 bushels of carrots per acre was produced, at an average cost of $19 per acre, as follows: "On rolling land, made rich with manure, lying to the south; ploughed 12 inches deep, the 15th of April; harrowed fine, drilled in rows 16 inches apart, between drills; soon as up, hoed them often to keep free from weeds; variety, long orange; time of digging, 1st of November." The average yield per acre of onions was 928

bushels, at an average cost of $32 per acre, as follows: "On rich prairie land, lying to the southeast; ploughed as soon as the frost was out; harrowed well and rolled down smooth; then drilled in four pounds of red Wethersfield seed per acre; as soon as up hoed well with hand hoe; gathered from 1st of September to last of October."

Swine.—The committee on swine express regret that only nine counties replied to their circular letter. Their reports state that the Chester White and Suffolk breeds, and their crosses, are the kinds generally raised in those counties, and at an average profit exceeding that from sheep.

Sheep.—The committee on sheep had replies from 25 counties, from which it appears that the Spanish Merino and its grades are the most profitable sheep, and best adapted to that State. A few report in favor of the long-wooled families, Cotswold, Leicester, &c. The average cost of keeping is $1 06 per head, and the average yield of wool four pounds.

Cattle.—Reports from but few counties were received by the committee, from which we find that both the pure Durhams and Devons, with their crosses, are distributed to a considerable extent; the former are at least three to one of the latter, and are principally raised for their beef-making qualities, the Devons for milk and work; the drovers give a small percentage more for graded stock, at same age and condition, than for the native or common. The average profits in raising cattle are from 20 to 35 per cent. on the capital invested; the average cost of wintering cattle per head is about $11: in the western part of the State they are kept at a cost not above $5 for the whole year; proper shelter in the winter is the exception rather than the rule; there are no diseases; the market is at home or Chicago. A correspondent in the western part of the State gives the following statement:

A calf at weaning time is worth $8; wintering four years, $20; salt, $2; the animal worth at present prices $50. A heifer or cow, three years old, costs $21 50; sells for $30.

Horses and mules.—The reports give preference to the Morgan and the Black Hawk stock for all work; if properly taken care of they sell readily at home for remunerative prices. For farm work and general profit the mule is preferred to the horse. Considerable attention is being given to improvement in breeding both horses and mules; there are very few English thoroughbred horses in the State.

Tame grasses.—From the reports received, and from their own observations and experience for the past ten years, the committee present the following facts: That timothy, clover, blue-grass, and red-top can be successfully and profitably raised in Iowa; that good meadows are most successfully produced by cultivation, and their seeding to grass; that they can be produced in wet lands without breaking, by harrowing early in the spring, seeding and rolling; that good pastures can be made on upland in the same manner, where the prairie grass has been pastured and killed out; that manuring pays as well or better on grass than upon any other crop; that upland prairie hay is better for horses that are fed on corn than tame hay, and is also good for other stock; that Hungarian hay is excellent for feed for stock, when properly fed, but not good for stock to run to at pleasure, as they will eat too much of it; that Iowa can compete successfully with any other State in raising grain and stock.

Fruit.—It is reported to the committee, from every part of the State, that all kinds of fruits grown in the northern and the middle States succeed very well, and are quite remunerative if properly cultivated, excepting only peaches and pears. The following species and varieties are recommended as having been successfully tested: For summer apples, Early Harvest, Red June, Red Astrachan, Sweet June, Early Pennock, Benoni, and Summer Pearmain; for fall, Rambo, Fall Wine, Maiden's Blush, Fall Pippin, and Fameuse; for winter, White W. Pearmain, Rawle's Jannet, Wine Sap, Yellow Bellflower, Tallman's Sweet, Willow Twig, and Jonathan. For cherries, Early Richmond

and May Duke. For currants, Red Dutch. For strawberries, Wilson's Albany. For gooseberries, Houghton's Seedling. For grapes, Concord, Delaware, Diana, Isabella, Hartford, Prolific, Catawba and Clinton; some one of which succeeds well in every part of the State. Nursery trees of all kinds grown in the State succeed better than those from the eastern States. Many failures are made in raising fruit trees for want of sufficient protection from the winds. A correspondent in one of the northern tier of counties says that, during a residence of 13 years, he has never known a spring frost to kill the apple blossoms.

Groves and evergreens.—The most interesting and valuable part of the report is that on the growing of timber. From some 30 counties, located in every section of the State, the most gratifying success is reported in forming groves from about a dozen species of the most valuable trees for timber and firewood, among which are the Soft Maple, the Cottonwood, the Black and the White Walnut, and the Lombardy Poplar. The Locust is being discarded in consequence of the borer, which destroys the tree when about five years old. The Soft Maple is a rapid grower, and bears crowding in groves; makes good firewood, and lasts well in fences, if cut in midsummer. There are groves of Cottonwood seven years old in which the trees measure 32 inches in circumference, and 30 feet in height; and of 10 years' growth measuring 15 inches in diameter. An experienced grower of trees gives the following as valuable, in the order mentioned, for artificial groves in central and northern Iowa: Cottonwood, Lombardy Poplar, Silver Maple, Sugar Maple, Chestnut, Ash, Oak, Hickory, Elm, Lime, Walnut, Butternut, and Larch. The belts and groves of timber throughout the State afford all the required facilities to obtain seeds, cuttings, &c., and great interest is manifested in growing timber. Evergreens are not much grown, but when care is taken they succeed very well; those preferred are the Norway Spruce, Balsam Fir, and White Cedar. Persons intending to grow timber on the prairies in the northwestern States will find in this report modes of planting trees suited to almost every condition of soil, climate, &c.

Reports of county societies.—One hundred and fifty-two pages of the secretary's report are occupied with the reports of county societies. Most of them contain facts already stated, and, in addition, the general agricultural condition of their several districts, which is very gratifying, not only to the producer but to all who take an interest in the affairs of the State.

Essays.—The remaining portion of the volume, 78 pages, is devoted to original essays, the opening one being on the "agricultural advantages of Iowa," followed by an article on "the Honey Locust as a hedge plant," and another on the Osage Orange. The subject of "apple culture" in Iowa is well handled by a good contributor, whose admonitions and instructions should be heeded by apple-growers there and elsewhere. "Barley and its uses" forms the subject of an elaborate essay, similar to one which appeared in the report of this Department for 1865, by the same author. An essay on "the cultivation of evergreen trees" will be found useful and instructive.

MISSOURI.

It is gratifying to notice the high standard that Missouri is striving to reach in every department of industry tending to develop her great agricultural, manufacturing, and mineral resources, as evidenced in the report published by the State Agricultural Society, edited by the secretary.

It is a volume of 560 pages, most of it in quite small type. The board of agriculture consists of 16 members, the governor and superintendent of public schools being ex-officio of the number. Of the representative members, one-third retire every year. The report of the corresponding secretary gives a general view of the condition of agriculture throughout the State, and embraces many subjects from various sources.

The secretary recommends the designation by the State of numerous points for the observation of meteorological changes, regarding such information of great importance to the agriculturist. A general drought throughout the State diminished the yield of grass, corn, and potatoes. The southern and western portion of the State being most favored with rains, the crops were all good. An early frost on the 20th of September injured the corn throughout the State.

South of latitude 38½° the peach crop was fair; north of that it was almost an entire failure. The apple crop was generally fair, and sold at good prices.

The grape crop, now of considerable importance, was unusually good. "On the whole, there has been very little cause for complaint in regard to the crops throughout the State." The grasshoppers made their appearance in the western part of the State in the fall, destroying everything in their progress before arrested by frost. Following some further remarks upon former devastations by the grasshopper, is an article on "grasshoppers and locusts," by B. D. Walsh, of Illinois, who says that a liberal bounty should be offered for the eggs. He quotes authority for stating that they breed in the Rocky mountains, and come down in great swarms, through the cañons leading to the more level country, where changes in the condition of life render it impossible for them to reproduce their species for more than a year or two, but that fresh incursions from the mountains make necessary the adoption of some system for the destruction of the eggs. He thinks they will never cause the same damage to crops east of the Mississippi as they have done west of that river.

The secretary proceeds with his remarks on the agricultural prosperity of the State, which he says was never so promising as at present, new life and energy having been infused into every industrial interest, a large influx of immigrants having given a decided impetus to all branches of labor. Fruit-growing is rapidly on the increase, and the fruit products are large and remunerative; grape-culture especially, including the manufacture of wine. The sorghum crop is esteemed of great value, to the cultivation of which, and the manufacture of sirup, the secretary devotes a large space. Flax and hemp were once leading crops in the State, and with the introduction of labor-saving machinery it is hoped they may again receive the attention they deserve.

The culture of the hop also receives especial notice, the report giving the large profits realized from this production, and an excellent article on the mode of culture, preparation for market, &c., illustrated with cuts.

The "General Condition of Agriculture" in the State follows the report of the secretary, as taken from the report of the statistician, which is presented in tabular form, giving facts of great value from correspondents in 27 counties. Attached to this is another table giving the "character of the season during the working months of the farm," observed in 33 counties. These tables and the information they give are commended to the attention of State agricultural societies.

"The Physical Geography of Missouri" is an article from the report of the geological survey of the State, and contains a brief description of the face of the country, including the navigable waters, the salt, sulphur, chalybeate, and petroleum springs; the water power and the prairies; also of the large bodies of coal, iron, lead, copper, zinc, cobalt, and nickel. The writer says that building material of the best quality is easy of access in nearly every portion of the State, including marble, granite, limestone, brick clay, cements, and road material; limestone, and coarse gravel are in abundance. It also describes the soils and timbers of the State, all sufficiently favorable to induce immigration.

"The Distribution of Trees and Shrubs in Missouri" is the next article, following which is a description of the "Mineral Spring of Missouri," by G. S. Broadhead. "Manufacturing in Missouri" is an article treating at considerable length on the "facilities and necessity for manufacturing establishments and their relation to the agriculture and commerce of the State," and "on what nature has done for

her, and what capital and skilled labor may do." It contains many important and suggestive facts and figures to prove that Missouri can present the best of inducements to capitalists to invest in manufacturing, and dilates on "the advantages and adaptability of St. Louis as a manufacturing city."

An article on tobacco, by R. M. Hubbard, describes minutely all the operations necessary in the management of the crop from the seed to its preparation for market. Mr. Hubbard says, "any kind of seed will adapt itself to the soil and climate where grown, and will acclimate itself, and will sometimes change some of its properties in two or three years, if brought from any foreign country. This is the reason why the qualities of tobacco in Cuba cannot be reproduced in this country, though fresh seeds from Cuba be sown every year." Prairie lands will raise nothing but a coarse and strong article of inferior value. The good farmer will not raise more than one or two crops on the same field after clearing. Stables will not do to dry tobacco in. Never replant either corn or tobacco.

"Sheep Husbandry" is the subject of the next article, followed by one on "Long-wools and Mutton Sheep." The writer of the last article expresses the opinion that combing wools will, for the next ten years, yield the largest profit, and therefore he advises those who keep but a few to select the Cotswold. A statement is given by a farmer in Lawrence county, who commenced with 86 sheep, of less than quarter-blood Merino, who cleared $982 in three years, which gave a net profit of $245 87 per year, and a flock of 126 sheep and lambs, worth $345. The number of lambs lost average about five per year. He considers sheep the most profitable stock. His flock yielded him more clear profit than 12 mares, worth from $200 to $1,500 each. He turns sheep on the prairie the 1st of May, and herds till the 1st of August, when they are turned into a meadow. In severe winter weather they are fed with stock corn.

An article on "The Board of Agriculture" suggests the advantage of a thorough system for the collection of agricultural statistics in the State, a more liberal appropriation by the legislature for this and other purposes, including the employment of a chemist for analyzing soils, minerals, grains, &c.; and a botanist, a metallurgist, &c., all to be appointed and directed by the board.

An essay on what constitutes "practical and scientific agriculture" follows, and then comes "What is Grass?" an address delivered by Solon Robinson, of New York, at one of the county societies in that State, which contains many excellent suggestions, and fully proves that "all flesh is grass."

"Agricultural Colleges; their true position among our educational institutions, and their relation to our national welfare," is the title of a well-digested article by Wm. Muir. He takes the position that practice must go with the text, as taught in the college, and that an institution which takes this as its basis will be a national blessing.

"History and Characteristics of the Galloway Cattle" is the next article. This breed is beginning to attract some attention in this country, and specimens have been imported recently from Scotland. It is a breed of great antiquity. Their admitted disposition to fatten readily and hardy constitution will make their introduction into the northern States very easy.

"Orchards," by Norman J. Coleman, contains the valuable experience of the author's years during his long residence in Missouri.

"The Proceedings of the State Board of Agriculture" follow the foregoing. The board held no State exhibition, and awarded no premiums of any kind during the year. Its receipts for the year appear to have been exclusively from the State government, and amounted to $4,500; the expenditures, principally for salaries, office furniture, and stationery, were $3,768.

Reports from 45 county societies occupy 105 pages. These reports generally give a good description of the soil, productions, and capabilities for agricultural and mechanical purposes, and are so full and satisfactory as to impart con-

siderable information, such as is desired by the numerous immigrants pouring into the State.

Their general testimony is favorable to the idea that Missouri is one of the most desirable of our western States, in which to secure pleasant and profitable locations for nearly all departments of industry. The information obtained is in response to questions propounded by the secretary of the board.

The next 17 pages are occupied by an article on "An Industrial University," discussing the subject of a separate educational institution, where farmers' sons may secure not only as good an education as is afforded by our colleges generally, but where, in addition, they will be taught how to apply their education practically on the farm. The establishment of such an institution in the State as early as possible is commended.

"The Proceedings of the Missouri Horticultural Society" occupy 176 pages, principally embracing discussions in regard to the cultivation of fruit in Missouri, and the best varieties adapted to its climate, soil, &c. The meeting appears to have been the great annual convention, and was well attended by fruit-growers from all parts of the State, and the information contained in the proceedings is varied and valuable to the fruit-grower in that region. The apple is treated of more than any other fruit.

A "History of the St. Louis Agricultural and Mechanical Association," with the award of premiums, occupies 139 pages. This association is a joint-stock company, which holds annual exhibitions, and appears to have taken the place and answered all the purposes of a State fair for the last 10 years, the first exhibition having been in 1856. The grounds of the association are, perhaps, better fitted up for its objects than any others in the United States, and in general character the exhibitions rank among the first in the Union. The grounds are located within three miles of St. Louis, and are reached by a railroad. The capital stock of the company is about $90,000, all of which has been expended in the purchase and preparation of the grounds, containing 50 acres, and the erection of suitable buildings.

The receipts and expenditures of the last exhibition are not given, and all the statements found to give any idea of the same are, that $18,389 were paid after the fair, to liquidate its only remaining debt, and that $11,000 remain in the treasury.

An essay follows "On the Raising and Management of Poultry," in which the author says, "the only varieties of the domestic fowl worthy of notice for general use are the Spanish, Dorking, Poland, Bramah Pootras, Game Fowl, Shanghai, Bantam, and Dung-hill. The three first-named being the best; the Spanish the handsomest and most profitable. Of ducks, he says there are but three kinds worth keeping, the Aylesbury, Rouen, and the Poland, the Aylesbury being decidedly the best.

An article on the "Rearing and Management of Horses and Mules" concludes the volume.

AGRICULTURAL AND HORTICULTURAL SOCIETIES AND CLUBS.

We present herewith as complete a list of the State, district, and county agricultural and horticultural societies and clubs now in operation in the United States as the Department is able to furnish from the data at hand. Interrogatory circulars were addressed to 1,367 organizations recorded upon the books of the

Department and 1,052 responses have been received. Seventy-five societies and clubs are reported as suspended or discontinued, principally during the war, and 977 as still in active operation, the names of the officers of which, together with the address of their secretaries, will be found below. The names of a few societies supposed to be in existence, but the lists of officers of which have not been returned by the secretaries, are included, and it is probable that there are about 100 other organizations in operation from which no reports have been received, with which the Department will be pleased to open correspondence. The number of libraries reported is 208, with about 34,800 volumes, or an average of 167. A large proportion report no libraries, while a few have small libraries, consisting chiefly of the annual reports of this Department and State boards, and societies. Of the boards and societies reporting, 37 are State organizations, as follows:

STATE AGRICULTURAL SOCIETIES.

CALIFORNIA.

California State Agricultural Society: Secretary, J. N. Hoag, Sacramento.

CONNECTICUT.

Connecticut State Agricultural Society: President, Hon. E. H. Hyde, of Stafford; secretary, T. S. Gold, of West Cornwall; treasurer, F. A. Brown, of Hartford. Organized in 1852. The society has no library.

Connecticut Board of Agriculture: President, Governor J. E. English, New Haven; vice-president, Lieutenant Governor E. H. Hyde, Stafford; secretary, T. S. Gold, West Cornwall. Organized in 1866. This board is designed to take the place of the State Society, but the organization of the latter is still maintained.

COLORADO.

Colorado Agricultural Society: President, Richard Sopris; vice-president, D. H. Nichols; secretary, W. D. Anthony; treasurer, George W. McClure; executive committee, C. H. McLaughlin, L. K. Perrin, J. H. Estabrook.

ILLINOIS.

Illinois State Agricultural Society: President, A. B. McConnell, of Springfield; secretary, John P. Reynolds, of Springfield; treasurer, John W. Bunn, of Springfield. Organized January, 1862. Number of volumes in library, about 300.

INDIANA.

Indiana State Agricultural Society, organized about the year 1857.

State Board of Agriculture: President, A. D. Hamrick, Putnam county; vice-president, Dr. John C. Helm, Delaware county; secretary, A. J. Holmes, Fulton county; treasurer, Carlos Dickson, Marion county.

IOWA.

Iowa State Agricultural Society: President, Peter Melendy, Cedar Falls; secretary, J. M. Shaffer, Fairfield; treasurer, George Sprague, Island Grove. Organized July, 1855. All are considered members who attend the State fairs, the number for 1857 being reported as 25,000. Number of volumes in the library, about 400.

KANSAS.

Kansas State Agricultural Society: President, Robert G. Elliott, Lawrence; secretary, H. J. Strickler, Topeka; treasurer, C. B. Lines, Topeka. Organized

January, 1862. Number of members, 300 to 400. Number of volumes in **library, 50.**

KENTUCKY.

Kentucky State Agricultural Society: Secretary, James J. Miller. Frankfort.

Kentucky Agricultural and Mechanical Association: President, Hon. W. B. Kinkead, Lexington; secretary and treasurer, Ernest Brennan. Organized in 1850. Number of members, about 500. No library.

LOUISIANA.

Louisiana State Fair Association: President, Dr. R. N. Day, Baton Rouge; secretary, A. D. Lytle, Baton Rouge; treasurer, S. M. Hart, Baton Rouge. Organized in 1841 and reorganized March, 1867. Number of members, about 70. Library and museum destroyed during the war.

MAINE.

Maine State Agricultural Society; Secretary, S. L. Boardman, Augusta.

MARYLAND.

Maryland Agricultural and Mechanical Association: President, Wm. Devries, Baltimore; secretary and treasurer, B. H. Waring, Baltimore. Organized November 14, 1866. There are 33 life members; no annual members taken as yet. No library. The State has appropriated $25,000 for the purchase of grounds.

MASSACHUSETTS.

Massachusetts Society for Promoting Agriculture: President, Geo. W. Lyman, Boston; secretary, P. C. Brooks, jr., Boston; treasurer, Theodore Lyman, Boston. Organized in 1792.

Massachusetts State Board of Agriculture: President, Governor Alexander H. Bullock, Boston; secretary, Charles L. Flint, Boston; has no treasurer, the State treasurer paying the bills. Organized April, 1852. Number of members, 37—30 chosen by the county societies, 3 appointed by the governor and council, and 4 *ex officio*. Number of volumes in library, 1,000. This board is organized as a department of the government for the purpose of collecting information and supervising the agricultural system adopted by the State. All societies drawing the State bounty are required by law to report to the board, and to conform to its established rules and regulations.

MICHIGAN.

Michigan State Agricultural Society: President, W. G. Beckwith, Cassopolis; secretary, R. F. Johnstone, Detroit; treasurer, E. O. Humphrey, Kalamazoo. Organized March 10, 1849. Annual membership, about 2,500; volumes in library, about 250, (of reports principally.)

The State Board of Agriculture was organized by act of the legislature in 1861, and is composed of 10 members, the governor of the State being president *ex officio*, and the president and secretary of the State Agricultural College are *ex officio* members. It has no official connection with the State Agricultural Society, but the county agricultural societies are required to report to it, and their transactions are published in the annual volume issued by the board. This volume also contains the report of the officers of the State Agricultural College, and is edited by the secretary, Sanford Howard.

MISSOURI.

Missouri State Board of Agriculture: President, Henry T. Mudd, Kirkwood; vice-president, George Husmann, Hermann; treasurer, William T. Essex, Kirkwood; recording secretary, John H. Tice, St. Louis; corresponding secretary, L. D. Morse, St. Louis.

NEBRASKA.

State Agricultural Society of Nebraska: President, J. Patrick, Omaha; secretary, C. H. Walker, Ashland; treasurer, ——. Walker, Omaha. Date of organization not reported. Number of members 18; board of directors. No library mentioned.

NEW HAMPSHIRE.

New Hampshire State Agricultural Society: Secretary, James O. Adams, Manchester.

NEW JERSEY.

New Jersey State Agricultural Society: President, N. W. Halstead, Newark; corresponding secretary, R. S. Swords; recording secretary, Wm. M. Force, Newark; treasurer, B. Haines, Elizabeth. Organized in 1865. Number of members, 185. No library.

NEW YORK.

New York State Agricultural Society: President, M. R. Patrick, Geneva; corresponding secretary, B. P. Johnson, Albany; treasurer, Luther H. Tucker, Albany. Organized in 1832; first volume of its transactions issued in 1841. Number of life members, 600. Number of volumes in the library, about 3,600.

OHIO.

Ohio State Board of Agriculture: President, James Fullington, Irwin Station, Union county; secretary, John H. Klippart, Columbus; treasurer, James Buckingham, Zanesville. Organized February 26, 1846. Number of members 10, five members being elected annually to serve two years by representatives from the county agricultural societies. Number of volumes in the library, 1,425.

OREGON.

Oregon State Agricultural Society: Secretary, A. C. Schwatka, Salem.

PENNSYLVANIA.

Pennsylvania Agricultural Society: President, A. Boyd Hamilton, Harrisburg; corresponding secretary, Lyman D. Gilbert, Harrisburg; chemist and geologist, Samuel S. Haldeman, Columbia. Organized in 1850.

RHODE ISLAND.

Rhode Island State Agricultural Society: Secretary, W. R. Staples, Providence.

TENNESSEE.

The agricultural bureau of Tennessee was suspended during the war, and the office became vacant by lapse of time, consequently no agricultural fairs have been held in the State since 1860, but there is a bill pending in the legislature to revive the bureau with all its branches of division and county fairs.

VERMONT.

Vermont State Agricultural Society: Secretary, Henry Clark, Poultney.

WISCONSIN.

Wisconsin State Agricultural Society: President, Keyes A. Darling, Fond du Lac; secretary, Dr. J. W. Hoyt, Madison; treasurer, David Atwood, Madison. Organized March 12, 1851. Number of life members, 500. Number of volumes in library, about 2,000.

Wisconsin Agricultural and Mechanical Association: President, E. H. Broadhead, Milwaukee; secretary, H. C. Bradley, Milwaukee; treasurer, H. Brightman, Milwaukee; chartered by the State in 1860. Located at Milwaukee. Number of members, 100. No library.

STATE HORTICULTURAL SOCIETIES.

DELAWARE.

Delaware Horticultural Society: President, Wm. Canley, of Wilmington; secretary, Edward Tatnall, jr., Wilmington; treasurer, Charles W. Howland, Wilmington. Incorporated January 29, 1847; located at Wilmington. Number of members, about 150. Library very small.

ILLINOIS.

Illinois State Horticultural Society: President, Judge A. M. Brown, of Villa Ridge; secretary, W. C. Flagg, of Alton; treasurer, Jonathan Huggins, of Woodburn. Organized December, 1856. Number of members, 125. About 100 volumes in library.

INDIANA.

Indiana Horticultural Society: President, L. D. G. Nelson, of Fort Wayne; corresponding secretary, Jos. Gilbert, of Terre Haute; recording secretary, Seth W. Pearson, Plainfield; treasurer, J. S. Dunlap, Indianapolis. Organized about 1860. Number of members, about 150 annually. No library.

IOWA.

Iowa State Horticultural Society: President, J. B. Grinnell, Grinnell; secretary, W. W. Beebe, Dubuque; treasurer, David Leonard, Burlington. Organized June 26, 1866. Number of members, 99. Annual meetings are held at the State capital in January. No library.

KENTUCKY.

Kentucky Horticultural Society: President, Thomas S. Kennedy, Louisville; secretary, Ormsby Hite, Louisville; treasurer, Benj. D. Kennedy, Louisville. Organized in 1840. Number of members, about 100. Number of volumes in library about 200. The meetings of the society during the fruit season are held every Saturday, for the purpose of exhibiting fruits, flowers, &c. The membership fee is $1 annually.

MASSACHUSETTS.

Massachusetts Horticultural Society: President, James F. C. Hyde, Newton; vice-presidents, Wm. C. Strong, Brighton; Charles O. Whitmore, Boston; H. H. Hunnewell, Wellesley; Wm. R. Austin, Dorchester; treasurer and corres-

ponding secretary, Edwin W. Boswell, Boston; recording secretary, Edward S. Rand, jr., Boston; professor of botany and vegetable physiology, John L. Russell, Salem. Organized in 1829; has a valuable library, and is, unquestionably, the wealthiest endowments of any similar institution in the country, and has erected one of the most tasteful buildings in Boston, (Horticultural Hall) at an expense of upwards of $200,000.

MINNESOTA.

Minnesota State Horticultural Society: President, A. McKinstry, Faribault; secretary, William Wheeler, Faribault; corresponding secretary, J. W. Haskins, Faribault; treasurer, John R. Kepnor, Little Valley. Organized in 1866.

MISSOURI.

Missouri State Horticultural Society: President, Rev. Charles Peabody, St. Louis; secretary, Wm. Muir, Fox Creek; treasurer, John H. Tice, St. Louis. Organized January, 1859. Number of members, 134. The library contains but a few volumes.

PENNSYLVANIA.

Pennsylvania State Horticultural Society: President, D. R. King, Philadelphia.

RHODE ISLAND.

Rhode Island Horticultural Society: President, Ex-Governor James Y. Smith, Providence; secretary, Henry R. Barker, Providence; treasurer, H. W. Godding, Providence. Organized September 6, 1845. Number of members, 575. No library.

TENNESSEE

Tennessee Horticultural Society: President, Phillip S. Fall; vice-president, William Stockell; corresponding secretary, Fred. H. French; recording secretary, James T. Bell; treasurer, James W. Hamilton; professor of botany, George S. Blackie, M. D.; professor of natural sciences, Joseph Jones, M. D. Instituted September 7, 1867; incorporated February 8, 1868. Number of members, 147; number of volumes in library, 50. This society is organizing auxiliary societies in each county of the State.

VIRGINIA.

Virginia Horticultural and Pomological Society: President, Wm. Gilham; recording secretary, J. C. Shields; corresponding secretary, Franklin Davis; treasurer, I. S. Tower; general agent, R. A. Williams, all of Richmond, Virginia.

WISCONSIN.

Wisconsin State Horticultural Society: President, Dr. Joseph Hobbins, Madison; recording secretary, O. S. Willey, Madison; corresponding secretary, Frank S. Lawrence, Janesville; treasurer, George A. Mason, Madison. Organized in 1865. Number of members, about 40. No library.

WOOL-GROWERS' ASSOCIATIONS.

NEW YORK.

New York State Sheep-Breeders' and Wool-Growers' Association: President, Henry S. Randall, Cortland village; secretary, H. D. L. Sweet, Syracuse; A. F. Wilcox, Fayetteville. Organized in 1864. The number of life members is

between 200 and 300. The association has held three annual sheep-shearings or fairs, which have been well attended. The annual fairs have excited great interest and emulation among sheep-breeders and wool growers. The sums annually offered in premiums have been from $1,500 to $2,000.

There are a considerable number of county and town wool-growers' associations, which hold annual fairs, and which are very successfully conducted.

ILLINOIS.

Illinois State Wool-Growers' Association: President, A. M. Garland, Chatham; secretary, Samuel P. Boardman, Lincoln; treasurer, Joshua L. Mills, Mt. Palatine. Organized September, 1864. Number of members, about 100. No library.

SORGO ASSOCIATION.

OHIO

Ohio Sorgo Association: President, Wm. Clough, Cincinnati; secretary and treasurer, John Branch, Loveland. Organized in 1861. Number of members, about 100. No library.

DISTRICT ORGANIZATIONS.

NEW ENGLAND.

New England Agricultural Society: Geo. B. Loring, Massachusetts, president; Daniel Needham, Groton, Massachusetts, secretary; Isaac N. Gage, New Hampshire, treasurer. Organized in 1864. Number of members, 1,000.

OHIO.

Union Agricultural Society: D. Brown, Xenia, president; James Galloway, Xenia, corresponding secretary; J. F. Wickersham, Jamestown, recording secretary and treasurer.

INDIANA.

Union Agricultural Society, (embracing Johnson, Shelby, Bartholomew, and Brown counties:) Israel Miller, president; J. M. Kelsey, Edinburgh, Johnson county, secretary; J. M. Thompson, treasurer. Organized in 1860. Number of members, 230.

ILLINOIS.

Northern Illinois Horticultural Society, (embracing Bureau, Jo Daviess, and McHenry counties:) Samuel Edwards, president; D. W. Scott, Galena, Jo Daviess county, secretary; L. Woodward, treasurer. Organized in 1867. Number of members, 150.

IOWA.

Cedar Valley Agricultural and Mechanical Association: Peter Melendy, president; Henry C. Hunt, Cedar Falls, Black Hawk county, secretary; F. Bockniler, treasurer. Organized in 1867. Number of members, 192.

Central Iowa District Agricultural Society: J. M. Tuttle, president; Mark Miller, Des Moines, Polk county, secretary; G. C. Griffeth, treasurer. Organized in 1860. Number of members, 675.

List of the county and township agricultural and horticultural societies and clubs now in operation in the United States.

Societies.	Post office address of secretary.	County.	President.	Secretary.	Treasurer.	No. of members.	Date of organization.	No. of volumes in library.
ALABAMA.								
TOWNSHIP SOCIETIES.								
Agricultural.								
East Alabama Agricultural and Horticultural Society	Opelika	Lee	C. A. Peabody	Sheldon Toomer	Sheldon Toomer	168	1867	......
ARIZONA.								
TOWNSHIP SOCIETIES.								
Agricultural.								
Muddy Agricultural and Gardeners' Club	St. Joseph	Pah-Ute	A. H. Bennett	R. M. Englestadt	A. T. Angell	18	1867	(*)
St. Thomas Farmers and Gardeners' Club	St. Thomas	do.	Warren Foote	W. M. Johnson	B. H. Paddock	25	1868	......
CALIFORNIA.								
COUNTY SOCIETY.								
Siskiyou County Agricultural Society	Yreka	Siskiyou	J. Steele	H. B. Warren	Dr. E. Wadsworth	400	1866	(*)
TOWNSHIP SOCIETY.								
El Dorado Agricultural Society	Placerville	El Dorado	Geo. G. Blanchard	....	Robt. Chalmers	200	1859	(†)
CONNECTICUT.								
COUNTY SOCIETIES.								
Agricultural.								
Fairfield County Agricultural Society	Norwalk	Fairfield	J. Camp	C. E. Plumb	J. W. Hubbell	1,400	1849	......
Hartford County Agricultural Society	Hartford	Hartford	D. H. Willard	F. A. Brown	W. H. Gross	900	1817	......
Litchfield County Agricultural Society	Litchfield	Litchfield	E. L. Thompson	J. D. Champlin, jr.	F. D. McNeill	400	1840	......
Middlesex County Agricultural Society	Middletown	Middlesex	Henry Tucker	E. Rockwell	E. Rockwell	282	1840	......
New Haven County Agricultural Society	Hamden	New Haven	W. B. Johnson	C. P. Augur	R. B. Bradley	200	1803	......
Tolland County Agricultural Society	Rockville	Tolland	C. Underwood	G. H. Kingsbury	J. Bishop	600	1853	......
Windham County Agricultural Society	Canterbury	Windham	R. W. Robinson	G. Sanger	E. Newbury	500	1853	......

* Small. † None.

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List of county and township agricultural and horticultural societies, &c.—Continued.

Societies.	Post office address of secretary.	County.	President.	Secretary.	Treasurer.	No. of members.	Date of organization.	No. of volumes in library.
TOWNSHIP SOCIETIES.								
Agricultural.								
Bethany and Woodbridge Agricultural Society	Bethany	New Haven	W. A. Clark	S. G. Davidson	S. G. Davidson	110	1858	......
East Hartford Agricultural Society	East Hartford	Hartford	Thomas Dowd	L. N. Olmstead	A. G. Olmstead	65	1864	......
Farmers' Club of West Cornwall	West Cornwall	Litchfield	H. M. Hart	T. S. Gold	....	25	1844	......
Greenwood Agricultural Society	West Winsted	....do.	G. B. Cleaveland	E. S. Woodford	W. F. Hatch	....	1828	......
Green's Farmers' Club	Westport	Fairfield	E. J. Taylor	S. B. Sherwood	S. B. Sherwood	26	1861	......
Hartford Farmers' Club	Hartford	Hartford	David Clark	A. R. Hilyer	A. R. Hilyer	....	1886	......
Housatonic Agricultural Society	New Milford	Litchfield	S. S. Logan	F. E. Starr	C. A. Todd	....	1858	......
Lebanon Farmers' Club	Lebanon	New London	E. M. Dolbeare	O. E. Pettis	O. E. Pettis	40	1860	40
Orange and Milford Agricultural Society	Milford	New Haven	D. Miles	W. H. Pond	E. B. Clark	333	1858	......
Ridgefield Agricultural Society	Ridgefield	Fairfield	E. H. Smith	B. K. Northrop	E. Jones	200	1857	......
Woodstock Agricultural Society	Putnam	Windham	O. H. Perry	John Dimon	S. M. Fennes	463	1858	......
Horticultural.								
Norwich Horticultural Society	Norwich	New London	I. M. Buckingham	J. L. Denison	J. L. Denison	247	1865	......
DELAWARE.								
COUNTY SOCIETIES.								
Agricultural.								
Kent County Agricultural Society	Dover	Kent	Henry Todd	M. Hayes	H. Ridgely	400	1834	......
Newcastle County Agricultural Society	Wilmington	Newcastle	Z. Townsend	R. McCabe	R. McCabe	200	1836	......
TOWNSHIP SOCIETIES.								
Agricultural.								
Farmers' Club of Milford	Milford	Kent	J. Yardley	W. C. Davidson	W. C. Davidson	35	1867	......
Lincoln Agricultural Society	Lincoln	Sussex	G. L. Stevens	A. M. Webb	J. Houston	44	1866	17
Prospect Hill Farmers' Club	Hockessin	Newcastle	G. Klair	T. L. J. Baldwin	T. L. J. Baldwin	15	1862	......

GEORGIA.								
COUNTY SOCIETIES.								
Agricultural.								
Polk County Farmers' Club	Cedartown	Polk	M. H. Bunn	L. B. Stone	L. B. Stone	36	1867	9
Putnam County Agricultural and Horticultural Society	Eatonton	Putnam	J. A. Ethridge	H. D. Capers	J. S. Reed	105	1868	
Richmond County Agricultural Society	Augusta	Richmond	R. Y. Harriss	Wm. C. Jones	Wm. C. Jones	119	1866	
ILLINOIS.								
COUNTY SOCIETIES.								
Agricultural.								
Adams County Agricultural and Horticultural Society	Quincy	Adams	J. W. Singleton	E. R. Morris	L. Bull		1857	
Bond County Agricultural Society	Greenville	Bond	J. A. Leaverton	J. S. Denny	J. S. Denny		1853	
Boone County Agricultural Society	Belvidere	Boone	D. W. Gates	A. E Jenner	O. H. Wright	898	1857	
Bureau County Agricultural Society	Princeton	Bureau	W. C. Trimble	H. C. Reed	C. P. Allen		1855	
Carroll County Agricultural Society	Mt. Carroll	Carroll	Samuel Preston	James Shaw	J. M. Stowell	500	1853	
Cass County Agricultural Society	Virginia	Cass	J. W. Seamen	R. W. Rabourn	Z. W. Gatton	37	1856	
Champaign County Agricultural Society	Urbana	Champaign	C. R. Griggs	G. W. Gere	I. W. Scroggs	200	1852	
Clark County Agricultural Society	Marshall	Clark	R. R. Scott	W. T. Adams	L. Booth	300	1857	
Clay County Agricultural and Horticultural Society	Louisville	Clay	J. Barker	J. A. Apperson	J. Wilders	100	1861	
Clinton County Agricultural and Mechanical Society	Carlyle	Clinton	M. J. O. Harnett	G. Van Hoorebeke	R. N. Ramsay	220	1865	
Coles County Agricultural and Mechanical Association	Charleston	Coles	Wm. Millars	George Monroe	J. K. Decker	133	1855	
Cook County Agricultural and Horticultural Society	Chicago	Cook	D. Worthington	H. D. Emery	H. D. Emery		1857	
Crawford County Agricultural Society	Robinson	Crawford	F. Paull	W. C. Wilson	E. Calahan	50	1856	
Cumberland County Agricultural Society	Majority Point	Cumberland	D. B. Green	A. G. Caldwell	Wiley Ross	91	1857	
DeKalb County Agricultural and Mechanical Society	DeKalb	DeKalb	N. Saum	S. O. Vaughan	H. Thompson	600	1860	
DeWitt County Agricultural Society	Clinton	DeWitt	J. Swigart	Edwin Weld	S. F. Lewis	125	1855	
Douglas County Agricultural Society	Tuscola	Douglas	E. McCarty	John Ervin	W. P. Cannon	60	1866	
Edgar County Agricultural and Mechanical Association	Paris	Edgar	Oneal Morris	J. A. Eads	H. Sandford	36	1861	(*)
Edwards County Agricultural and Industrial Society	Albion	Edwards	J. Tribe, sr.	George Bower	George Harris	300	1857	
Fayette County Agricultural and Mechanical Association	Vandalia	Fayette	H. F. Gerauld	J. W. Ross	J. N. McCord	150	1856	
Greene County Agricultural and Mechanical Society	Carrolton	Greene	J. Bowman	G. W. Davis	J. E. Brace	175	1854	
Grundy County Agricultural Society	Morris	Grundy	O. B. Goleshee	P. A. Armstrong	J. W. Lawrence	500	1853	(†)
Henderson County Agricultural Society	Oquawka	Henderson	S. Hutchinson	R. S. McAllister	A. R. Graham	800	1855	
Henry County Agricultural Society	Cambridge	Henry	R. Allen	S. D. Alfred, jr	J. C. Edwards	1,000	1853	
Jo Daviess County Agricultural Society	Galena	Jo Daviess	S. S. Brown	R. S. Norris	N. Stahl	175	1855	
Kane County Agricultural Society	Geneva	Kane	W. P. West	J. Herrington	W. W. Ormsbee		1851	
Kankakee County Agricultural Society	Kankakee	Kankakee	L. Milk	D. C. Taylor	W. F. Kenaga	60	1855	
Kendall County Agricultural and Mechanical Society	Plano	Kendall	D. Shontz	A. N. Beebe	J. S. Seely	360	1854	
Knox County Agricultural Society	Knoxville	Knox	M. P. De Long	A. W. Martin	J. H. Lewis	500	1853	
Lake County Agricultural Society	Waukegan	Lake	N. Landon	J. Y. Cory	W. H. Ellis	500	1852	
LaSalle County Agricultural Society	Ottawa	La Salle	J. W. Armstrong	F. F. Brower	J. Stone	300	1852	(*)
Lee County Agricultural Society	Dixon	Lee	F. W. Coe	J. T. Little	J. C. Ayres		1858	
Livingston County Agricultural Society	Pontiac	Livingston	J. C. Morrison	J. F. Culver	J. Duff	40	1857	
McDonough County Agricultural Society	Macomb	McDonough	J. H. Smith	S. Chandler	C. V. Chandler	1,154	1854	(*)
McHenry County Agricultural Society	Woodstock	McHenry	W. M. Jackson	C. H. Russell	C. H. Russell		1852	(*)

* Reports. † Small.

List of county and township agricultural and horticultural societies, &c.—Continued.

Societies.	Post office address of secretary.	County.	President.	Secretary.	Treasurer.	No. of members.	Date of organization.	No. of volumes in library.
Macon County Agricultural Society	Decatur	Macon	J. H. Pickrell	J. K. Warren	J. Milliken	400	1856	(†)
Macon County Fruit-growers' Association	do	do	G. M. Wood	G. W. Bright	G. W. Bright	50	1867	......
Macoupin County Agricultural and Mechanical Society	Carlinville	Macoupin	D. Gore	L. B. Corbin	J. S. Otwell	....	1852	......
Madison County Agricultural and Mechanical Society	Edwardsville	Madison	J. C. Burroughs	E. M. West	W. J. Barnsback	250	1854	......
Madison County Farmers' Club, No. 1	Paddock's Grove	do	J. Montgomery	H. H. Gibson	J. H. Smith	43	1866	20
Madison County Farmers' Club, No. 2	Edwardsville	do	D. B. Gilham	J. D. Whitman	J. C. Burroughs	45	1868	......
Marion County Agricultural Society	Salem	Marion	C. W. Webster	N. E. Adams	J. J. Bennett	500	1854	......
Monroe County Agricultural and Mechanical Society	Waterloo	Monroe	A. F. Gardner	H. C. Talbott	J. F. Gotshall	300	1861	......
Montgomery County Agricultural Society	Hillsboro'	Montgomery	Andrew Blass	W. K. Jackson	W. K. Jackson	....	1857	(*)
Morgan County Agricultural and Mechanical Association	Jacksonville	Morgan	M. C. Goltra	J. C. Reynolds	J. G. Parrell	120	1851	......
Moultrie County Agricultural and Horticultural Society	Sullivan	Moultrie	A. N. Smyser	J. B. Titus	J. A. Freeland	100	1858	(*)
Peoria County Agricultural Society	Peoria	Peoria	J. Littleton	R. Bills	H. G. Anderson	320	1852	50
Perry County Agricultural Society	Tamaroa	Perry	H. S. Osborne	B. G. Roots	E. B. Rushing	500	1857	......
Pike County Agricultural Society	Pittsfield	Pike	Wm. Grimshaw	Wm. E. Norris	S. Griggsby	....	1852	......
Pope County Agricultural and Horticultural Society	Golconda	Pope	G. Thompson	W. V. Eldredge	P. D. Field	247	1856	......
Putnam County Agricultural Society	Hennepin	Putnam	H. C. Thomas	W. H. Casson	A. T. Purviance	452	1846	......
Randolph County Agricultural Society	Sparta	Randolph	W. B. Taylor	Wm. Addison	Wm. Addison	1,250	1852	......
Richland County Agricultural Society	Olney	Richland	D. D. Marquis	J. C. Scott	W. C. Rickard	269	1856	......
St. Clair County Agricultural and Mechanical Society	Belleville	St. Clair	J. Rainey	G. F. Hilgard	F. H. Pieper	389	1854	......
Schuyler County Agricultural Society	Rushville	Schuyler	G. Baker, sr.	E. M. Anderson	E. Anderson	900	1855	......
Stark County Agricultural Society	Toulon	Stark	Wm. Nowlan	P. Nowlan	Wm. Lowman	1,200	1853	......
Stephenson County Agricultural Society	Freeport	Stephenson	H. Diemer	J. Burrell	L. W. Ginteau	120	1854	......
Tazewell County Agricultural Society	Frémont	Tazewell	J. Sawyer	S. Talbot, jr	J. L. Hayward	400	1849	(*)
Vermillion County Agricultural and Mechanical Society	Catlin	Vermillion	J. H. Oakwood	G. W. Tilton	J. A. Church	800	1851	......
Wabash County Agricultural Society	Mt. Carmel	Wabash	J. Seiler	M. J. Habberton	M. J. Habberton	190	1861	60
Washington County Agricultural Society	Nashville	Washington	L. M. Kane	T. B. Needles	E. H. Ayers	1,000	1854	......
Wayne County Agricultural Society	Fairfield	Wayne	A. Rinard	John Wilson	Jacob Hall	420	1857	......
Whiteside County Agricultural Society	Sterling	Whiteside	C. D. Sanford	L. Hapgood	W. McCune	1,579	1858	......
Will County Agricultural Society	Joliet	Will	W. R. Steel	B. F. Russell	C. M. Hammond	500	1867	......
Winnebago County Agricultural Society	Rockford	Winnebago	S. Cunningham	H. P. Kimball	G. S. Haskell	200	1853	......
Horticultural.								
Mason County Horticultural Society	Havana	Mason	J. D. W. Bowman	J. Cochrane	A. D. Hopping	18	1866	......
Peoria County Horticultural Society	Peoria	Peoria	A. P. Bartlett	B. L. T. Bourland	B. L. T. Bourland	30	1863	......
Pike County Horticultural Society	Pittsfield	Pike	I. M. Bush	J. T. Worthington	D. B. Hicks	30	1867	(*)
Tazewell County Horticultural Society	Pekin	Tazewell	B. S. Prettyman	H. K. Alexander	Wm. Stanberry	63	1863	30

TOWNSHIP SOCIETIES.

Agricultural.

Ashley Farmers and Fruit-growers' Club	Ashley	Washington	P. W. Cameron	J. M. Hunter	G. Reyer	22	1867	20
Atlanta Union Agricultural Society	Atlanta	Logan	J. Bell	F. Hoblit	A. H. Dills	101	1860	(*)
Downing Farmers' Club	Hamilton	Hancock	A. J. Lincoln	Thomas Gregg	Thomas Gregg	20	1867	......
Dwight Agricultural Club	Dwight	Livingston	E. R. Stevens	S. T. K. Prime	E. Kenney	15	1861	......
Ethel Agricultural Society	Ethel	Mercer	J. H. Broomfield	J. M. Goff	J. T. Morford	40	1866	30
Farmers and Mechanics' Club	East Cambridge	Henry	R. Mascall	S. B. Randall	......	30	......	50
Farmers' Club of Elmore	Elmore	Peoria	E. P. Lambertson	W. H. Adams	Wm. Andrews	20	1864	30
Farmers' Club of North Henderson	Oxford	Henry	G. W. Greenwood	J. B. Hoag	J. B. Hoag	30	1859	......
Farmers' Club of Town of Thompson	Scales Mound	Jo Daviess	J. W. Foster	John Wenner	G. Wartoby	35	1858	100
Farmers' Club and Mechanics' Institute	Danville	Vermillion	W. M. Tennery	B. G. Harley	C. K. Myers	450	1858	......
German Agricultural Society	Effingham	Effingham	J. S. Sutter	H. Bernhard	H. Gruenwald	25	1867	......
German Farmers' Club	Spring Bay	Woodford	M. Moyemont	Joseph Vetter	G. M. Noe	28	1861	(†)
Horse Show Association	Vandalia	Fayette	H. F. Jenauld	G. L. Jackson	G. L. Jackson	20	1860	......
Howardsville Agricultural Society	Howardsville	Stephenson	A. M. Durkee	E. Latham	E. T. Perry	59	1859	(*)
Kickapoo Farmers' Club	Kickapoo	Peoria	J. H. Wilkinson	Eng. Nader	R. Radley	30	1861	......
Loami Farmers' Club	Loami	Sangamon	A. M. Browning	J. S. Kirk	W. F. Joy	26	1868	......
Odell Agricultural and Horticultural Society	Odell	Livingston	S. V. Wooley	S. S. Morgan	T. J. Apkins	40	1868	......
Pilot Grove Agricultural Society	Ridge Farm	Vermillion	I. C. Mendenhall	Thomas Folgier	Wm. Rice	25	1864	25
Savoy Farmers' Club	Champaign	Champaign	C. N. Anderson	A. R. Hay	H. S. Hay	42	1864	15
Sycamore Farmers' Club	Sycamore	De Kalb	J. E. Waite	H. L. Boies	S. C. Hale	33	1867	10

Horticultural.

Alton Horticultural Society	Alton	Madison	J. E. Starr	B. L. Kingsbury	B. F. Long	65	1853	20
Bunker Hill Horticultural Society	Bunker Hill	Macoupin	J. V. Hopper	J. F. Cummings	J. A. Delano	52	1866	......
Grand Prairie Horticultural Society	Onarga	Iroquois	E. Daggy	J. D. Van Norman	E. Cobb	30	1868	......
Onarga Horticultural Society	...do.	...do.	J. B. Clark	E. C. Hall	Lyman Pike	40	1865	60
Quincy Horticultural Society	Quincy	Adams	R. Rankin	Wm. Stewart	Wm. Stewart	30	1867	......
Rockford Horticultural Society	Rockford	Winnebago	Jason Marsh	H. P. Kimball	E. L. Abell	150	1856	......
Urbana Horticultural Society	Urbana	Champaign	J. O. Cunningham	W. H. Somers	Wm. Sirr	61	1867	......
Villa Ridge Horticultural Society	Villa Ridge	Pulaski	O. Edson	A. M. Brown	J. Lufkin	20	1865	......
Warsaw Horticultural Society	Hamilton	Hancock	A. C. Hammond	Thomas Gregg	Thomas Gregg	32	1866	(*)

INDIANA.

COUNTY SOCIETIES.

Agricultural.

Allen County Agricultural and Horticultural Society	Fort Wayne	Allen	Adam Link	F. P. Randall	S. J. Housh	150	1851	300
Dearborn County Agricultural Society	Lawrenceburg	Dearborn	David E. Rees	P. L. Mathews	Wm. T. Ferris	516	1852	(*)
Decatur County Agricultural Society	Greensburg	Decatur	R. R. Cobb	F. M. Weadon	W. S. Woodfill	100	1851	......
DeKalb County Agricultural Society	Auburn	De Kalb	W. Griswold	W. W. Griswold	L. J. Blair	68	1853	......
Delaware County Agricultural Society	Muncie	Delaware	J. S. Buckles	J. A. Wachtell	S. F. Brady	841	1852	......
Elkhart County Agricultural Society	Goshen	Elkhart	Thomas Miller	J. W. Irwin	E. W. H. Ellis	141	1851	......
Fayette County Joint Stock Agricultural and Mechanical Society	Connersville	Fayette	T. Caldwell	Jno. L. Bailey	W. H. Beck	212	1861	......

* Reports. † Small.

List of county and township agricultural and horticultural societies, &c.—Continued.

Societies.	Post office address of secretary.	County.	President.	Secretary.	Treasurer.	No. of members.	Date of organization.	No. of volumes in library.
Franklin County Agricultural Society	Whitcomb	Franklin	C. C. Binckley	J. A. Colescott	John King	800	1852	
Fulton County Agricultural Society	Rochester	Fulton	John Pence	D. Agnew	S. Davidson	120	1857	
Gibson County Agricultural and Horticultural Society	Princeton	Gibson	Andrew Lewis	W. L. Dorsey	Jos. Small	250	1854	
Grant County Agricultural Society	Marion	Grant	J. Sweetser	D. P. Cubberly	J. N. Turner	500	1853	
Hancock County Agricultural Society	Greenfield	Hancock	J. B. Simmons	J. H. Carr	J. W. Walker	160	1853	
Harrison County Agricultural Society	Corydon	Harrison	David Jordan	S. B. Luckett	Thomas McGrain	220	1860	
Hendricks County Agricultural Society	Danville	Hendricks	Frank Hains	S. N. Hardin	E. Hunt		1848	
Henry County Joint Stock Agricultural Society	New Castle	Henry	T. Willroit	Elisha Clift	J. Holland	135	1867	
Howard County Agricultural Society	Kokomo	Howard	Willis Blanch	A. L. Sharp	Wm. Smith	78	1866	
Huntingdon County Agricultural Society	Huntingdon	Huntingdon	P. W. Zent	R. Simonton	J. Roche	300	1868	
Jackson County Agricultural Society	Seymour	Jackson	T. B. Shields	L. E. Rumrill	S. H. Hoffman	72	1866	
Jefferson County Agricultural Society	Madison	Jefferson	J. Bramwell	A. Daniells	Joel Dickey		1852	
Jennings County Agricultural Society	Vernon	Jennings	J. B. Curtis	B. Behymer	Smith Vawter			
Johnson County Agricultural Society	Franklin	Johnson	N. M. Schofield	C. Byfield	W. S. Webb	48	1867	
Knox County Agricultural Society	Vincennes	Knox	J. D. Williams	H. A. Foulke	R. McCord		1851	
Kosciusko County Agricultural Society	Warsaw	Kosciusko	S. Hoppis	W. B. Funk	M. I. Long	365	1856	
La Grange County Agricultural Society	La Grange	La Grange	Nelson Slater	F. P. Griffith	R. McCloskey	27		
Lake County Agricultural Society	Crown Point	Lake	H. Wason	A. E. Beattie	J. C. Sauerman	400	1851	
La Porte County Agricultural Society	La Porte	La Porte	J. Sutherland	E. G. McCollum	I. N. Whitehead	588	1850	
Madison County Agricultural Society	Anderson	Madison	I. Pittsford	J. R. Holston	E. M. Jackson	450	1855	
Marion County Agricultural and Horticultural Society	Indianapolis	Marion	J. S. Dunlap	J. T. Francis	W. S. Hubbard	110	1859	80
Monroe County Agricultural Society	Bloomington	Monroe	J. W. McCrea	J. Small	J. Bunger		1856	
Montgomery County Agricultural Society	Crawfordsville	Montgomery	T. H. Fitzgerl	A. W. Lemon	J. Heaton, sr	56	1853	
Morgan County Agricultural Society	Brooklyn	Morgan	R. H. Tarlton	I. N. Gregory	I. N. Gregory	750	1851	87
Owen County Agricultural Society	Spencer	Owen	W. M. Franklin	J. W. Archer	J. V. Wolfe	180	1855	300
Porter County Agricultural Society	Valparaiso	Porter	M. Cornell	Don A. Salyer	S. W. Smith	80	1851	
Posey County Agricultural Society	New Harmony	Posey	E. T. Cox	F. D. Bolton	A. E. Fretagert	150	1858	(*)
Putnam County Agricultural Society	Greencastle	Putnam	R. M. Hazlett	D. C. Donnohue	F. P. Nelson	30	1852	
Randolph County Agricultural Society	Winchester	Randolph	N. P. Heaston	J. B. Routh	N. Reed	527	1852	
Ripley County Agricultural Society	Osgood	Ripley	J. H. Colston	W. R. Glascow	H. Gallagher	50	1867	
Rush County Agricultural Society	Rushville	Rush	Thomas N. Link	Edward Payne	J. R. Mitchell	194	1856	
St. Joseph County Agricultural Society	Mishawaka	St. Joseph	N. Frame	C. G. Towles	Wm. Miller	500	1851	50
Spencer County Agricultural and Horticultural Society	Rockport	Spencer	Z. H. Cook	L. B. Deason	J. Brenner	477	1856	
Sullivan County Agricultural Society	Sullivan	Sullivan	Murray Briggs	H. K. Wilson	L. Stuart	340	1852	
Switzerland and Ohio County Agricultural Society	Vevay	Switzerland	L. Bledsoe	Wm. Rous	S. Stow	57	1852	
Tipton County Agricultural Society	Tipton	Tipton	J. M. Patterson	M. E. Clark	Samuel Wayne		1859	
Union County Joint Stock Agricultural Society	Liberty	Union	W. M. Clark	T. W. Bennett	T. J. Leviston	100	1866	
Vanderburgh County Agricultural and Horticultural Soci'y	Evansville	Vanderburgh	J. H. Morgan	P. Hornbrook	P. Hornbrook	111	1855	(*)
Vermillion County Agricultural Society	Newport	Vermillion	J. Henderson	J. A. Bell	J. Heighfill	400	1866	

Wabash County Agricultural Society	Wabash	Wabash	H. Caldwell	A. Taylor	J. D. Miles	95	1853	......
Wayne County Joint Stock Agricultural Association	Centreville	Wayne	R. Baldridge	S. Johnson	H. B. Rupe	100	1867	......
Wells County Agricultural Society	Blufton	Wells	J. McFadden	E. A. Horton	C. T. Melsheimer	700	1867	......
Horticultural.								
Henry County Horticultural Society	New Castle	Henry	P. P. Rifner	T. B. Redding	T. B. Redding	25	1864	......
Kosciusko County Horticultural Society	Warsaw	Kosciusko	J. S. Frazer	J. B. Dodge	J. B. Dodge	47	1667	......
La Porte County Horticultural and Pomological Society	La Porte	La Porte	G. L. Andrew	G. S. Seymour	G. S. Seymour	53	1865	(*)
TOWNSHIP SOCIETIES.								
Agricultural.								
Agricultural, Horticultural, and Pomological Society	Sunman	Ripley	J. Schlict	C. Y. C. Alden	Chas. Stevens	30	1868	......
Bethlehem Union Club	Otto	Clark	R. Nash	J. T. Hamilton	Wm. Kelley	75	1867	100
Brewersville Farmers' Club	Brewersville	Jennings	F. Coryell	W. L. Richardson	T. J. Reynolds	32	1867	......
Bridgeport Agricultural and Horticultural Society	Bridgeport	Marion	L. Hawkins	J. H. Nicholson	D. M. Mills	20	1866	......
Busseron Agricultural and Horticultural Society	Oaktown	Knox	W. W. Curry	J. M. Sheppard	W. C. Shugert	25	1863	60
Clay Township Agricultural Club	Amo	Hendricks	J. P. Kendall	Elwood Stanton	H. Kendall	21	1868	8
Farmers' Agricultural Society	Dupont	Jefferson	J. H. Cline	J. W. Carga	G. Greaston	24	1868	......
Farmers' Club of St. Peters	St. Peters	Franklin	John Wintz	J. V. Bauer	F. Fussner	20	1863	15
Geneva Farmers' Club	North Vernon	Jennings	G. Ferran	A. S. Prather	A. S. Prather	10	1866	......
Grand Prairie Agricultural Society	Pine Village	Warren	Thos. O. Moore	R. J. Odle	D. Moffitt	......	1857	......
Greenwood Farmers and Mechanics' Club	Greenwood	Johnson	A. C. Woods	J. A. Polk	John Brewer	38	1857	800
Harrison Farmers and Fruit Growers' Club	Terre Haute	Vigo	J. F. Soule	J. G. Heinl	A. Hosier	24	1868	......
Honey Creek Agricultural and Horticultural Society	New London	Howard	John Rodkey	J. E. Hollowell	Eli Carter	500	1865	......
Hopewell Agricultural Society	Paris	Jennings	H. P. Wilkerson	B. F. Byfield	W. Woodfill	12	1864	......
Iroquois Township Farmers' Club	Brook	Newton	Andrew Hess	J. T. Graham	G. McCraig	32	1866	......
Jarvis Agricultural Society	Jarvis	De Kalb	W. H. Madden	J. E. Rose	G. W. Young	50	1865	......
Marion Farmers' Club	Paris	Jennings	Thomas Davis	Wm. R. Davis	T. Boyd	42	1864	103
Metamora Farmers' Club	Metamora	Franklin	L. Gates, sen	J. P. Alley	J. Fleming	11	......	......
Paris Agricultural Society	Paris	Jennings	Wm. Cave	Wm. Deputy	H. S. Dixon	25	1866	......
Pigeon Township Agricultural Society	Dale	Spencer	W. L. Brewner	R. Hendrickson	J. Beardsley	31	1863	......
Pioneer Farmers' Club	Monrovia	Morgan	S. Hadley	J. A. Taylor	......	18	1864	......
Quaker Point Farmers' Club	Quaker Hill	Vermillion	W. F. Henderson	J. P. Haworth	L. Walthall	30	1865	25
Slate Farmers' Club	Slate	Jennings	S. Butler	L. W. Hudson	S. Deputy	30	1866	......
Spice Run Farmers' Club	Dupont	Jefferson	J. McClellan	G. M. Harlan	J. F. Shepherd	27	1867	......
Tell City Agricultural and Horticultural Society	Tell City	Perry	F. Kleiber	A. Meninger	M. Deckert	13	1862	12
Warren and Fountain Agricultural Society	Attica	Fountain	J. E. Hughes	T. C. Wiggin	W. W. Ennis	600	1854	......
Horticultural.								
Kosciusko Horticultural and Pomological Society	Warsaw	Kosciusko	J. S. Frazer	G. R. Thralls	G. R. Thralls	25	1865	......
Madison Horticultural Society	Madison	Jefferson	A. C. Lanier	C. C. Cornett	C. C. Cornett	60	1867	......
Plainfield Horticultural Society	Plainfield	Hendricks	J. H. Nicholson	S. W. Pearson	A. Alderson	40	1863	......
Terre Haute Horticultural Society	Terre Haute	Vigo	H. D. Scott	Jos. Gilbert	T. E. F. Barnes	100	1865	......

* Reports.

List of county, and township agricultural and horticultural societies, &c.—Continued.

Societies.	Post office address of secretary.	County.	President.	Secretary.	Treasurer.	No. of members.	Date of organization.	No. of volumes in library.
IOWA.								
COUNTY SOCIETIES.								
Agricultural.								
Adair County Agricultural Society	Fontenelle	Adair	W. H. Hendricks	W. B. Hall	John Loucks	41	1860	......
Adams County Agricultural Society	Quincy	Adams	John Barnett	John Bixby	E. T. Burgan	60	1858	......
Appanoose County Agricultural Society	Centreville	Appanoose	Alpheus Davison	C. A. Stanton	D. L. Strickler	236	1856	......
Audubon County Agricultural Society	Hamlin Grove	Audubon	E. W. Pearl	I. L. Frost	J. A. Pearl	50	1858	75
Benton County Agricultural Society	Vinton	Benton	J. C. Frair	W. M. Kirkpatrick	Joseph Houck	224	1858	......
Black Hawk County Agricultural Society	Waterloo	Black Hawk	Patrick McIsaac	R. A. Whitaker	Sylvester Bagg	208	1857	......
Boone County Agricultural and Horticultural Society	Mineral Ridge	Boone	John A. Hull	W. C. Martin	J. L. Breet	167	1867	......
Bremer County Agricultural Society	Waverly	Bremer	Wm. P. Harris	H. C. Moore	W. V. Lucas	232	1866	......
Buchanan County Agricultural Society	Independence	Buchanan	D. S. Lee	L. W. Hart	D. L. Dunham	200	1858	......
Cedar County Agricultural Society	Tipton	Cedar	H. C. Piatt	S. L. Smith	S. W. Young	150	1861	......
Cerro Gordo County Agricultural Society	Mason City	Cerro Gordo	George Vermilya	T. G. Emsley	E. D. Huntley	44	1859	......
Chickasaw County Agricultural Society	New Hampton	Chickasaw	H. M. Mixer	L. J. Young	Charles McCullow	100	1860	......
Clarke County Agricultural Society	Osceola	Clarke	J. L. Millard	M. B. Reese	Alex. Jeffrey	....	1867	......
Clayton County Agricultural Society	National	Clayton	J. S. Kung	Charles Watkins	A. C. Rogers	425	1861	......
Clinton County Agricultural Society	Lyons	Clinton	A. R. Cotton	W. A. Sanborn	W. F. Coan	750	1860	......
Crawford County Agricultural Society	Denison	Crawford	Andrew D. Malony	S. J. Comfort	S. B. Smyth	45	1859	(*)
Dallas County Agricultural Society	Adel	Dallas	Ezra Van Fossen	T. R. North	L. Thornburgh	131	1856	......
Davis County Agricultural Society	Bloomfield	Davis	George W. Johnson	John A. Demuth	B. T. Peak	100	1857	......
Decatur County Agricultural Society	Leon	Decatur	G. W. Baker	S. H. Gates	George Gammon	120	1856	......
Delaware County Agricultural Society	Manchester	Delaware	Ferd. Durham	A. S. Blair	J. C. Skinner	84	1861	......
Des Moines County Agricultural Society	Burlington	Des Moines	John Patterson	S. F. Rouse	Lyman Cook	90	1859	......
Dubuque County Agricultural Society	Dubuque	Dubuque	L. Murphy	John King	W. C. Chamberlain.	....	....	......
Dubuque County Farmers' Club	Dubuque	Dubuque	John King	Secretary resigned.	Godfrey Bloohlinger	20	1860	250
Fayette County Agricultural Society	West Union	Fayette	J. W. Rogers	S. S. Ainsworth	Wm. McClintock	44	1855	(*)
Floyd County Agricultural Society	Charles City	Floyd	R. W. Humphrey	H. Wilbur	D. W. Balch	....	1859	......
Franklin County Agricultural Society	Hampton	Franklin	David Church	George Beed	R. S. Benson	130	1860	......
Fremont County Agricultural Society	Sidney	Frémont	H. J. Heaton	J. O. Bodenhamer	T. L. Buckham	462	1868	(*)
Guthrie County Agricultural Society	Guthrie Centre	Guthrie	Joseph J. Groom	Jacob Gingrich	William J. Revell	93	1858	......
Hamilton County Agricultural Society	Webster City	Hamilton	S. L. Rose	R. E. Fairchild	L. S. Estes	96	1867	......
Henry County Agricultural Society	Mount Pleasant	Henry	O. H. P. Buchanan.	J. W. Satterthwaite	J. H. Whiting	42	1865	......
Howard County Agricultural Society	Cresco	Howard	E. Gillet	W. R. Mead	George Eck	300	1866	......
Humboldt County Agricultural Society	Lott's Creek	Humboldt	Simon B. Bellows	Eber Stone	John H. Ford	45	1858	(†)
Ida County Agricultural Society	Ida	Ida	E. B. West	M. G. Aldrich	J. H. Aldrich	20	1867	......

Iowa County Agricultural Society	Marengo	Iowa	Thomas J. Talbott	Robert McKee	Robert McKee	217	1857	......
Jackson County Agricultural Society	Maquoketa	Jackson	C. E. Shattuck	W. S. Belden	H. B. Griffin	427	1855	......
Jackson County Farmers and Fruit Growers' Club	Bellevue	Jackson	Wm. T. Wynkoop	Samuel G. Smith	W. Simpson	12	1865	(‡)
Jackson County Farmers' Club	Maquoketa	Jackson	W. Clark	W. F. Major	Ed. Lake	48	1864	3
Jasper County Agricultural Society	Newton	Jasper	Thomas McCord	John J. Vaughan	John A. Harris	......	1855	......
Jefferson County Agricultural Society	Fairfield	Jefferson	Charles David	John R. Shaffer	George A. Wells	373	1852	......
Johnson County Fruit-growers' Association	Iowa City	Johnson	H. W. Lathrop	M. W. Davis	M. W. Davis	42	1867	14
Johnson County Agricultural and Mechanical Society	Iowa City	Johnson	George Paul	S. E. Paine	A. D. Mordoff	300	1854	......
Jones County Agricultural Society	Anamosa	Jones	C. T. Lamson	J. D. Walworth	Edwin Blakeslee	1,260	1855	......
Kossuth County Agricultural Society	Algona	Kossuth	Ambrose A. Call	James H. Warren	James H. Warren	120	1855	......
Lee County Agricultural and Horticultural Society	West Point	Lee	J. J. Brise	B. F. Woodman	J. B. Lawson	800	1852	......
Louisa County Agricultural Society	Wapello	Louisa	James S. Hurley	E. B. Lacy	Jesse Harris	132	1867	......
Madison County Agricultural Society	Winterset	Madison	C. B. Lothrop	D. E. Cooper	W. W. McKnight	100	1856	......
Mahaska County Agricultural Society	Oskaloosa	Mahaska	F. L. Downing	J. H. Green	S. G. Caster	1,000	1852	......
Marion County Agricultural Society	Knoxville	Marion	H. B. Lyman	F. Christofel	S. L. Collins	325	1858	......
Marshall County Agricultural Society	Marshalltown	Marshall	E. N. Chapin	Wm. Bremner	John Turner	215	1857	......
Mitchell County Agricultural Society	Mitchell	Mitchell	R. K. Crum	S. H. Franklin	J. P. Brush	62	1858	......
Monroe County Agricultural Society	Albia	Monroe	John Clark	J. W. Robb	A. M. Giltner	240	1854	......
Page County Agricultural Society	Clarinda	Page	Isaac Vanarsdol	J. R. Morledge	J. R. Hinchman	93	1865	40
Poweshiek County Agricultural Society	Brooklyn	Poweshiek	Alexander Meigs	O. F. Dorance	B. M. Talbot	310	1865	......
Ringgold County Agricultural Society	Mount Ayr	Ringgold	Levi S. Terwilliger	Aaron Cole	John T. Williams	70	1859	......
Scott County Agricultural Society	Davenport	Scott	Chauncey Krum	W. H. Haight	O. S. McNeil	834	1853	......
Story County Agricultural Society	Nevada	Story	David Child	Sam. S. Statler	Henry Boynton	60	1858	20
Tama County Agricultural Society	Tama City	Tama	Jacob Reedy	A. M. Batchelder	B. A. Hall	113	1866	......
Taylor County Agricultural Society	Bedford	Taylor	Josiah Litteer	R. B. Kinsell	Wm. Mahan	80	1859	......
Union County Agricultural Society	Afton	Union	N. W. Rowell	S. W. McElderry	W. H. H. Norris	100	1858	......
Warren County Agricultural Society	Indianola	Warren	A. Hasty	A. Swan	B. S. Noble	200	1854	......
Washington County Agricultural Society	Washington	Washington	Benj. McCoy	John H. Holden	P. S. Sheldon	......	1856	......
Wayne County Agricultural Society	Corydon	Wayne	John H. Chapman	W. W. Thomas	Joshua Prugh	58	1859	......
Webster County Agricultural Society	Fort Dodge	Webster	N. H. Hart	Isaac Garmoe	E. E. Prusia	55	1866	......
Horticultural.								
Marshall County Horticultural Society	Marshalltown	Marshall	Thomas Mercer	E. N. Chapin	Geo. Glick	20	1865	12
TOWNSHIP SOCIETIES.								
Agricultural.								
Almoral Agricultural Society	Almoral	Delaware	N. G. Strickland	J. B. Dunham	T. R. Long	15	1864	10
Amana Society	Homestead	Iowa	C. M. Winzenrid	John Beyer	John Beyer	300	1860	......
Bartlett Farmers' Society	Bartlett	Frémont	A. P. Davenport	Wm. Metcalf	Jos. Hapier	30	1867	......
Belmont Agricultural Society	Sandyville	Warren	James Brown	Eli Townsend	Aaron Brown	19	1866	......
Bethlehem Farmers' Club	Bethlehem	Wayne	Benjamin Brown	P. P. Black	P. P. Black	40	1866	......
Blue Grass Farmers' Society	Davenport	Scott	W. E. Schimdt	F. Bein	......	16	1855	600
Boyer Valley Farmers' Club	Logan	Harrison	John Fry	D. Michael	H. Reel	22	1862	35
Clay Farmers' Club	Liberty	Clark	T. V. Harrison	George Crawford	George Crawford	20	1859	......
Dayton Township Farmers' Club	Clarksville	Butler	Shadrack Bonwell	Phil. I. Ebersold	C. H. Forney	21	1864	16
Deep Creek Farmers' Club	Lyons	Clinton	Jairus Wilcox	Daniel Conrad	Alpheus Hunter	24	1865	20
Farmers' Club of Jefferson	Denver	Bremer	M. Farrington	T. Fountain	Wm. Beard	9	1861	50
Farmers' Club of Humboldt	Lott's Creek	Humboldt	Nelson Martin	T. Ellwood Collins	Theo. J. Smith	16	1867	......
Farmers' Club of Jefferson	Reeder's Mills	Harrison	Stephen King	John Q. Jolly	Francis Millerman	25	1868	......

*Agricultural reports. †Small. ‡Very few.

List of county and township agricultural and horticultural societies, &c.—Continued.

Societies.	Post office address of secretary.	County.	President.	Secretary.	Treasurer.	No. of members.	Date of organization.	No. of volumes in library.
Farmers and Mechanics' Club of Monticello	Monticello	Jones	A. H. Marvin	James Davidson	M. M. Moulton	400	1866	330
Farmers' Agricultural Society of Southport	Promise City	Wayne	L. T. Davis	O. W. Heckethorn	O. W. Heckethorn	15	1868	......
Farmers' Boys' Agricultural Society	Garden Grove	Decatur	H. G. Stiles	R. D. Kellogg	S. P. McNeil	68	1867	......
Franklin Farmers' Club	Eldora	Harden	E. Kilgore	C. F. Clarkson	John Peters	10	1859	(*)
Freeland Farmers' Club	Chariton	Lucas	L. S. Huntley	N. W. Plymate	Lottie C. Plymate	36	1866	12
Fulton Farmers' Club	Durant	Jackson	Charles Trunkey	C. W. Norton	Harvey Baker	106	1867	3
Harris Grove Farmers' Club	Logan	Harrison	F. T. Hill	Jacob T. Stern	John Vore	20	1866	......
Hickory Grove Farmers' Association	Amity	Scott	Charles Stier	J. Langheim	Fr. Müller	29	1860	262
Jackson Township Farmers' Club	Anamosa	Jones	Anthony Waggoner	W. C. Monroe	William Jeffries	40	1867	(*)
Jefferson Agricultural Society	Oswego	Warren	D. Berger	J. M. Jaillite	J. M. Jaillitte	31	1866	9
Lansing German Agricultural Society	Lansing	Allamakee	Joseph Brewer	Herman Roese	Landlin Haas	41	1863	......
Locust Grove Farmers' Club	Sandyville	Warren	M. H. Wilson	Wm. H. Schooley	Thomas Hoopes	17	1866	15
Low Moor Farmers' Club and Library Association	Low Moor	Clinton	John L. Haskell	B. R. Palmer	B. R. Palmer	30	1862	320
Maple Valley Farmers' Club	Ida	Ida	A. J. Teall	M. G. Aldrich	M. G. Aldrich	10	1866	30
Maysville Farmers' Club	Maysville	Franklin	Samuel Carbaugh	Myron Carbaugh	Henry White	25	1865	......
Mount Pleasant Agricultural Club	Sand Springs	Delaware	William L. Wright	James Harper	Samuel Tibbitts	28	1866	......
Newbern Farmers' Club	Newbern	Marion	S. S. Arnold	J. W. Whitlock	P. Bucklew	20	1867	......
Osage Farmers' Club	Wilton	Muscatine	P. Doran	S. D. Stoddard	A. Bullock	28	1863	12
Progressive Farmers' Club	Mount Pleasant	Henry	James Wright	Wm. Hedge	......	70	1865	50
Richland Farmers' Club	Ottumwa	Wapello	John R. Kerfoot	Isaac H. Page	Isaac H. Page	20	1866	40
Richland Farmers' Club	Fontanelle	Adair	Milton Chapman	J. S. Ewing	......	8	1862	......
Rock Grove Agricultural and Horticultural Club	Rock Grove	Floyd	Edson Gaylord	W. P. Gaylord	M. H. Nickerson	150	1867	......
Salem Farmers' Club	Salem	Henry	J. W. Frazier	David Burden	M. L. Crew	47	1866	......
Scotch Grove Agricultural Society	Monticello	Jones	John E. Holmes	John E. Lovejoy	M. H. Hutton	54	1855	......
South Prairie Farmers' Club	Chariton	Lucas	G. W. Mitchell	S. G. Rose	J. Sheppard	10	1860	8
Social Farmers' Club of Clarksville	Clarksville	Butler	Alexander Glen	J. C. Abbott	Edwin Fowle	27	1868	......
Springfield and Inland Club	York Prairie	Cedar	John Cooper	C. A. Pound	I. W. Stanton	32	1862	......
Sugar Creek Farmers' Club	Wilton	Cedar	John Leith	James H. Leech	C. F. Healy	39	1857	......
Union District Agricultural Society	West Liberty	Cedar	Moses Varney	Alonzo Shaw	Samuel E. Arter	234	1859	......
Union Farmers' Club	Afton	Union	E. Cornwall	W. T. Cornwall	L. B. Clark	26	1863	......
Union Township Farmers' Club	New York	Wayne	Daniel Hare	D. M. Clark	J. B. Hatten	50	1865	......
White Oak Point Agricultural Society	Indianola	Warren	William Hutt	E. Bilbo	W. A. Eberman	32	1864	......
Winfield Farmers' Club	Davenport	Scott	John Pollock	David Hardie	John Little	38	1858	......
Horticultural.								
Keokuk Horticultural Society	Keokuk	Lee	Geo. O. Hilton	E. H. Wickersham	Henry Weyand	25	1859	50
Southwestern Horticultural Association	Clarinda	Page	Charles Reed	S. H. Kridlebaugh	Joseph Cathcart	30	1860	50

KANSAS.

COUNTY SOCIETIES.

Agricultural.

Brown County Agricultural Society	Hiawatha	Brown	S. Speer	E. M. Morrill	Ira J. Lacock	97	1864	......
Crawford County Agricultural, Horticultural, and Mechanical Society.	Cato	Crawford	E. Brown	Wm. Roberts	Wm. Stiteler	26	1867	......
Franklin County Agricultural Society	Ottawa	Franklin	W. L. Harrison	H. T. Welsh	G. S. Holt	100	1866	......
Johnson County Agricultural and Mechanical Association	Olathe	Johnson	John Inlow	J. L. Wines	J. R. Brown	250	1866	......
Marshall and Washington County Agricultural and Mechanical Society.	Marysville	Marshall	J. Weisback	J. W. Bollinger	F. Schmidt	174	1864	40
Osage County Agricultural Society	Burlingame	Osage	H. H. George	Peter Kirby	H. D. Preston	80	1857	45
Horticultural.								
Leavenworth County Horticultural Society	Leavenworth	Leavenworth	J. C. Walkinshaw*	S. J. Darrah	S. J. Darrah	44	1862	50
TOWNSHIP SOCIETIES.								
Agricultural.								
Crescent Hill Agricultural Society	Ossawatomie	Miami	R. Smith	W. H. Berkey	C. Barnard	24	1868	......
Farmers and Mechanics' Association	Clinton	Douglass	J. C. Steele	E. G. Macy	G. W. Umbarger	25	1866	......
Farmers' Club of Gardner	Gardner	Johnson	W. M. Shean	W. I. Bigelow	W. J. Ott	75	1864	100
Hesper Farmers' Club	Eudora	Douglass	A. J. Jennings	Wm. Stroud	John Conger	25	1866	7
Ossawatomie Agricultural Society	Ossawatomie	Miami	T. Roberts	J. Q. White	C. Barnard	22	1868	......
Springdale Farmers' Club	Springdale	Leavenworth	D. F. Walker	A. F. Evans	C. H. Chapin	46	1868	......
Washington Agricultural, Horticultural, and Mechanical Association.	Wathena	Doniphan	S. Hatch	B. Harding	J. J. Markham	23	1866	54
Wyandotte Library Association	Wyandotte	Wyandotte	A. Beatty	E. F. Heisler	J. C. Welch	86	1867	565

KENTUCKY.

COUNTY SOCIETIES.

Agricultural.

Bourbon County Agricultural Society	Paris	Bourbon	B. I. Clay	B. F. Pullen	Wm. Mitchell	800	1838	......
Clark County Agricultural Society	Winchester	Clark	J. P. Gay	J. P. Herndon	R. N. Winn	125	1860	......
Harrison County Agricultural and Mechanical Association.	Cynthiana	Harrison	L. Desha	J. Q. Ward	L. Van Hook	200	1856	......
Lincoln County Farmers' Club	Stanford	Lincoln	J. S. Murphy	H. T. Harris	B. W. Dunn	52	1868	......
McCracken County Agricultural and Mechanical Ass'n	Paducah	McCracken	G. Kay	T. V. Glass	J. F. Kabb	....	1866	......
Nelson County Agricultural Association	Bardstown	Nelson	N. G. Thomas	J. D. Wickliffe	J. W. Muir	62	1866	......
Scott County Agricultural and Mechanical Association	Georgetown	Scott	J. S. Sinclair	H. L. Parks	R. C. Adams	35	1865	......
Shelby County Agricultural and Mechanical Association	Shelbyville	Shelby	A. Middleton	L. W. Smith	J. A. Middleton	255	1859	......
Warren County Agricultural and Mechanical Association	Bowling Green	Warren	P. I. Potter	J. L. McLure	J. D. Duncan	100	1867	......
Woodford County Agricultural and Mechanical Associat'n	Versailles	Woodford	F. P. Kinkead	W. D. Gay	L. Sublett	250	1866	......

* Agricultural Reports.

List of county and township agricultural and horticultural societies, &c.—Continued.

Societies.	Post office address of secretary.	County.	President.	Secretary.	Treasurer.	No. of members.	Date of organization.	No. of volumes in library.
TOWNSHIP SOCIETIES.								
Agricultural.								
Farmers' Club of Central Kentucky	Lexington	Fayette	J. J. Hayden	J. M. Tipton	D. S. Coleman	123	1867	......
Henderson Agricultural Society	Henderson	Henderson	John Funk	P. Sasseen	G. Green	190	1866	......
South Kentucky Fair Ground Association	Glasgow	Barren	Z. R. Huggins	W. L. Porter	J. E. Gorin	86	1852	......
Southern Kentucky Fruit-growers' Society	Bowling Green	Warren	J. T. Donaldson	Andrew Poage	L. L. Cooke	30	1858	......
LOUISIANA.								
TOWNSHIP SOCIETIES.								
Agricultural.								
Agricultural and Industrial Corporation of North Louisiana	Monroe	Wachita	J. P. Stubbs	J. G. Richardson	G. Chamberlain	79	1863	(†)
Mechanics' and Agricultural Fair Association	New Orleans	Orleans	I. N. Marks	T. G. Rhett	T. G. Rhett	700	1860	......
Silver Creek Agricultural and Horticultural Society	Osyka	Pike county, Miss.	W. Smith	Wm. Shilling	B. F. Ellzey	10	1867	......
Washington Agricultural and Horticultural Society	...do	...do	H. W. L. Lewis	T. E. Tate	J. J. Alford	13	1860	30
MAINE.								
COUNTY SOCIETIES.								
Agricultural.								
Androscoggin County Agricult'l and Horticult'l Society	Lewiston	Androscoggin	Z. A. Gilbert	W. R. Wright	D. Farrar	321	1852	50
Cumberland County Agricultural Society	West Gorham	Cumberland	Moses Fogg	S. Dingley	J. C. Noyes	100	1852	......
Franklin County Agricultural Society	Farmington	Franklin	E. Staples	P. P. Tufts	W. Weeks	400	1840	......
Kennebec County Agricultural Society	East Winthrop	Kennebec	E. O. Bean	D. Cargill	J. P. Johnson	385	1818	(*)
Lincoln County Agricultural and Horticultural Society	Waldoboro'	Lincoln	T. Simmons	W. S. Brown	J. Bodge	600	1852	......
Oxford County Agricultural Society	Norway	Oxford	A. D. White	Elliott Smith	Elliott Smith	300	1842	......
Piscataquis County Agricultural and Horticultural Society	Foxcroft	Piscataquis	A. A. Robinson	Lyman Lee	Lyman Lee	178	1853	......
TOWNSHIP SOCIETIES.								
Agricultural.								
China Agricultural Society	Dirigo	Kennebec	Caleb Jones	J. W. Jacob	J. C. Varney	30	1857	60

East Somerset Agricultural Society	Hartland	Somerset	J. Rowell	T. Fuller	A. J. Moon	140	1832	......
Hancock Agricultural Society	Ellsworth	Hancock	J. P. Langdon	S. Wasson	Moses Hale	497	1859	......
Kennebec Union Agricultural and Horticultural Society	Gardiner	Kennebec	Wm. H. Merrill	Sumner Smiley	Cyrus Libbey	300	1860	......
Norridgewock Farmers' Club	Norridgewock	Somerset	Edward Rowe	Edward Stone	Chas. Barker	310	1858	60
North Kennebec Agricultural Society	Waterville	Kennebec	T. S. Lang	D. R. Wing	Ira H. Low	30	1847	182
North Waldo Agricultural Society	Unity	Waldo	J. Fowler, jr	Eli Vickery	Eli Vickery	75	1861	......
Penobscot and Aristook Union Agricultural and Horticultural Society.	Patten	Penobscot	Jacob Sanders	Luther Rogers	J. S. Hall	80	1853	......
Penobscot Sheep-keepers' Association	Bangor	...do.	J. S. Bennock	D. M. Dunham	D. M. Dunham	200	1863	30
Sagadahoc Agricultural and Horticultural Society	Topsham	Cumberland	W. P. Walker	G. A. Rogers	A. G. Poland	......	1848	......
Sharpleigh and Acton Agricultural Society	Acton	York	H. Bodwell	J. B. Ricker	Thomas Low	192	1867	8
West Oxford Agricultural Society	Fryeburg	Oxford	James Walker	D. L. Lamson	T. C. Ward	84	1851	......
West Penobscot Agricultural Society	Kenduskeag	Penobscot	E. F. Crane	T. P. Batchelder	T. P. Batchelder	600	1855	......
West Washington Agricultural Society	Columbia	Washington	John Plummer	J. L. Bucknam	H. C. Hall	597	1859	......
Wilton Farmers and Mechanics' Club	East Wilton	Franklin	L. Adams	D. Fletcher	D. Fletcher	65	1858	60
Horticultural.								
Bangor Horticultural Society	Bangor	Penobscot	J. C. Weston	A. L. Simpson	J. E. Godfrey	200	1849	......
MASSACHUSETTS.								
COUNTY SOCIETIES.								
Agricultural.								
Barnstable County Agricultural Society	Barnstable	Barnstable	N. Crocker	G. A. King	W. Chipman	275	1844	......
Bristol County Central Agricultural Society	Fall River	Bristol	N. Durfee	Robert Adams	S. A. Dean	650	1860	(†)
Essex County Agricultural Society	Danvers	Essex	Wm. Sutton	C. P. Preston	E. H. Payson	1,100	1818	1,000
Franklin County Agricultural Society	Greenfield	Franklin	T. J. Field	E. E. Lyman	E. E. Lyman	1,700	1850	......
Hampden County Agricultural Society	Springfield	Hampden	G. Dwight	J. N. Bagg	J. E. Russell	1,014	1844	......
Hampshire County Agricultural Society	Amherst	Hampshire	L. Stockbridge	O. G. Couch	O. G. Couch	1,027	1849	......
Norfolk County Agricultural Society	Dedham	Norfolk	M. P. Wilder	H. O. Hildreth	C. C. Churchill	1,412	1849	......
Plymouth County Agricultural Society	Bridgewater	Plymouth	C. G. Davis	L. Keith	L. Parsons	1,017	1819	200
Worcester County Agricultural Association	Worcester	Worcester	S. H. Howe	C. M. Miles	C. M. Miles	1,200	1818	......
Horticultural.								
Worcester County Horticultural Society	Worcester	Worcester	F. H. Dewey	E. W. Lincoln	F. W. Paine	800	1840	1,000
TOWNSHIP SOCIETIES.								
Agricultural.								
Amesbury and Salisbury Agricultural and Horticultural Society.	Amesbury	Essex	George Turner	W. H. B. Currier	A. Sawyer	403	1856	400
Berkshire Agricultural Society	Pittsfield	Berkshire	R. Goodman	J. E. Merrill	H. M. Pierson	900	1811	......
Bernardston Farmers' Club	Bernardston	Franklin	John Sanderson	......	Henry Slater	36	1860	......
Bolton Agricultural and Mechanical Association	Bolton	Worcester	S. W. Houghton	Lyman Moore	S. W. Houghton	30	1850	......
Chelmsford Farmers' and Mechanical Association	Chelmsford	Middlesex	T. J. Pinkham	D. B. Emerson	Joseph Reed	85	1859	......
Concord Farmers' Club	Concord	...do.	W. H. Hunt	Minot Pratt	Elijah Wood	33	1852	......

* Small. † None.

List of county and township agricultural and horticultural societies, &c.—Continued.

Societies.	Post office address of secretary.	County.	President.	Secretary	Treasurer.	No. of members.	Date of organization.	No. of volumes in library.
Danvers Farmers' Club	Danvers	Essex		Andrew Nichols	Andrew Nichols	26	1862	150
Eastern Hampden Agricultural Society	Palmer	Hampden	W. W. Cross	J. F. Holbrook	L. Dimock	150	1856	......
East Hampton Farmers' Club	East Hampton	Hampshire	G. A. Clark	L. L. Wright	L. L. Wright	29	1858	......
Farmers' Club of Rutland	Rutland	Worcester	G. A. Putnam	C. A. Henry	C. A. Henry	68	1863	330
Greenfield Farmers' Club	Greenfield	Franklin		A. K. Warner		40	1856	......
Groton Farmers and Mechanics' Club	Groton	Middlesex	Daniel Needham	J. H. Bourn	A. Spaulding	159	1855	......
Hampshire, Franklin, and Hampden Agricultural Society	Northampton	Essex	M. J. Smith	A. P. Peck	H.K. Starkweather.	400	1818	......
Harvard Farmers and Mechanics' Association	Harvard	Worcester	F. A. Willard	T. Bull	L. Sawyer	115	1850	......
Hingham Agricultural and Horticultural Society	Hingham Centre	Plymouth	A. Fearing	Fearing Burr	J. H. French	580	1858	200
Holden Farmers and Mechanics' Club	Holden	Worcester	Charles Flagg	D. F. Parmenter	J. H. Gleason	60	1857	40
Hoosac Valley Agricultural Society	North Adams	Berkshire	B. F. Mills	W. W. Gallup	S. Burlingame	265	1860	......
Housatonic Agricultural Society	Great Barrington	....do.	M. S. Bidwell	H. T. Robbins	J. Dewey, jr	1,251	1842	......
Hubbardston Farmers' Club	Hubbardston	Worcester	L. Williams, jr	M. C. Wheeler	M. C. Wheeler	42	1860	150
Lee Farmers' Club	Lee	Berkshire		T. D. Thatcher	D. Dresser	60	1860	300
Leominster Farmers and Mechanics' Club	Leominster	Worcester	Wm. Tilton	J. M. Bronson	E. K. Knapp	178	1851	......
Lexington Farmers' Club	Lexington	Middlesex	H. Reed	H. Holmes	W. D. Phelps	30	1854	400
Martha's Vineyard Agricultural Society	West Tisbury	Dukes	H. Vincent	D. A. Cleaveland	G. Luce	189	1858	50
Middlesex Agricultural Society	Concord	Middlesex	A. Gage	J. B. Moore	R. Barrett	1,500	1794	......
Middlesex, North, Agricultural Society	Lowell	....do.	Asa Clement	J. P. Varnum	H. A. Fielding	675	1855	320
Middlesex, South, Agricultural Society	Framingham	....do.	T. J. Damon	J. W. Brown	C. S. Whitmore	720	1854	......
Milford Farmers' Club	Milford	Worcester	J. E. Eames	A. Mead	B. Leland	200	1859	300
Milton Farmers' Club	Milton	Norfolk	C. Breck	A. K. Teele	C. Breck	20	1860	200
Nantucket Agricultural Society	Nantucket	Nantucket		Alex. Macey, jr		150	1856	......
North Reading Farmers and Mechanics' Club	North Reading	Middlesex	C. P. Howard	D. G. Abbott	D. G. Abbott	100	1861	120
North Stockbridge and Lenox Farmers' Club	Lenox	Berkshire	E. J. Dunning	W. D. Cortiss	H. B. Wellington	92	1853	50
North Wrentham Farmers' Club	North Wrentham	Norfolk	Daniel Rounds	D. Sharp	A. C. Taylor	52	1859	35
Quincy Agricultural Library Association	Quincy	....do.	R. B. Lenchars	John J. Glover	John O. Holden	50	1860	200
Southborough Farmers' Club	Southborough	Worcester	H. Wilson	D.W. C. McMasters	Franklin Este	106	1860	......
South Deerfield Farmers' Club	South Deerfield	Franklin	F. Bartlett	H. Severance	H. Severance	17	1864	......
Stafford's Hill Farmers' Club	South Adams	Berkshire	A. Wood	S. W. Lincoln	J. B. Farnum	25	1862	......
Sunderland Farmers' Club	Sunderland	Franklin	N. A. Smith	John M. Smith	John M. Smith	40	1851	......
Swansea Agricultural Library Association	Swansea	Bristol	Seth Brown	N. B. Gardner	J. E. Eastabrooks	30	1866	125
Union Agricultural Society	Blanford	Hampden	G. C. Gibbs	E. W. Boise	L. R. Nye	109	1859	......
Waltham Farmers' Club	Waltham	Middlesex	C. A. Welch	L. P. Frost	Jonas Clark	154	1857	300
Westborough Agricultural Society	Westborough	Worcester	Charles P. Rice	B. B. Nourse	B. B. Nourse	360	1839	......
West Newbury Farmers' Club	Newburyport	Essex	A. L. Moore	E. Gardiner	C. Rogers	30	1856	......
Whately Farmers' Club	Whately	Franklin	E. Bardwell	J. M. Crafts	L. Cooley	52	1860	......
Worcester, North, Agricultural Society	Fitchburg	Worcester	E. T. Miles	L. H. Bradford	T. C. Caldwell	632	1850	200
Worcester, Southeast, Agricultural Society	Milford	....do.	W. Knowlton	A. Mead	A. C. Fay	......	......	......

MARYLAND.								
COUNTY SOCIETIES.								
Agricultural.								
Montgomery County Agricultural Society	Rockville	Montgomery	J. H. Bradley	W. V. Bouic	George Peter	500	1846	......
Washington County Agricultural and Mechanical Society	Hagerstown	Washington	D. Brumbaugh	E. M. Mobley	G. F. Heyser	200	1852	......
TOWNSHIP SOCIETIES.								
Agricultural.								
Agricultural Society for the Eastern Shore	Easton	Talbot	Edward Lloyd	E. L. F. Hardcastle	W. M. Hollyday	13	1819	......
Farmers' Club of Sandy Spring	Sandy Spring	Montgomery	....	R. T. Bentley	....	15	1842	......
Horticultural.								
Sandy Spring Horticultural Society	Olney	Montgomery	F. Miller	Mrs. M. B. Magruder	....	20	1863	......
MICHIGAN.								
COUNTY SOCIETIES.								
Agricultural.								
Barry County Agricultural Society	Hastings	Barry	A. Ryerson	J. M. Nevins	S. C. Prindle	350	1851	......
Berrien County Agricultural Society	Niles	Berrien	Wm. Bort	J. B. Fitzgerald	M. H. Landon	600	1850	......
Branch County Agricultural Society	Coldwater	Branch	A. Chandler	J. H. Beech	I. G. Miles	525	1851	......
Calhoun County Agricultural Society	Marshall	Calhoun	E. D. Beach	F. W. Dickey	C. P. Dibble	800	1849	300
Cass County Agricultural Society	Cassapolis	Cass	Israel Ball	D. M. Howell	C. H. Kingsbury	500	1851	......
Clinton County Agricultural Society	St. John's	Clinton	J. T. Hollister	Robert Smith	B. H. Beers	400	1856	......
Eaton County Agricultural Society	Charlotte	Eaton	D. B. Hale	T. D. Green	E. A. Foote	845	1855	......
Genesee County Agricultural Society	Flint	Genesee	E. W. Rising	F. H. Rankin	Oren Stone	1,123	1859	......
Genesee County Sheep-breeders and Wool-growers' Ass'n	....do	....do	Charles Pettis	....do	....do	61	1865	......
Gratiot County Agricultural Society	Ithaca	Gratiot	W. W. Comstock	W. E. Winton	E. Crosby	200	1866	......
Hillsdale County Agricultural Society	Hillsdale	Hillsdale	Goodwin Howard	F. M. Holloway	D. Beebe	125	1851	......
Ionia County Agricultural Society	Ionia	Ionia	J. B. Hutchins	W. D. Arnold	J. W. Loomis	152	1860	......
Jackson County Agricultural Society	Jackson	Jackson	J. DePuy	B. Porter	G. W. Kennedy	1,000	1852	......
Kent County Agricultural Society	Grand Rapids	Kent	L. S. Scranton	O. H. Simonds	John Porter	147	1849	......
Lenawee County Agricultural Society	Adrian	Lenawee	A. S. Berry	J. I. Knapp	B. S. Berry	1,000	1859	......
Livingston County Agricultural Society	Howell	Livingston	K. W. Bingham	A. Tooley	L. C. Smith	500	1853	......
Macomb County Agricultural Society	Romeo	Macomb	G. W. Phillips	C. F. Mallary	A. W. Sterling	400	1850	......
Monroe County Agricultural Society	Monroe	Monroe	Ira R. Grosvenor	S. G. Clarke	C. Ives	487	1849	......
Oakland County Agricultural Society	Pontiac	Oakland	L. Woodward	G. W. Brock	E. B. Comstock	1,000	1867	......
Ontonagon County Agricultural Society	Ontonagon	Ontonagon	G. C. Jones	T. J. Lasier	L. Johnson	100	1867	......
Ottawa County Agricultural Society	Lamont	Ottawa	T. B. Lillie	Russell Baxter	J. Luther	300	1856	......
Van Buren County Agricultural Society	Paw Paw	Van Buren	F. M. Manning	O. H. P. Sheldon	E. G. Butler	358	1851	......
Washtenaw County Agricultural and Horticult'l Society	Ann Arbor	Washtenaw	C. Wheeler	N. M. Schoff	J. T. Swathel	1,050	1848	......
TOWNSHIP SOCIETIES.								
Agricultural.								
Battle Creek Agricultural and Mechanical Society	Battle Creek	Calhoun	J. D. Adams	P. H. Emerson	Geo. P. Burrall	1,200	1859	......

List of county and township agricultural and horticultural societies, &c.—Continued.

Societies.	Post office address of secretary.	County.	President.	Secretary.	Treasurer.	No. of members.	Date of organization.	No. of volumes in library.
Excelsior Agricultural Society	Greenville	Montcalm	M. C. Wathins	W. Divine	R. R. Cook	534	1865	......
Farmers and Mechanics' Association	Pinckney	Livingston	Tate Watson	C. M. Wood	R. C. Barnum	180	1863	......
Farmers, Mechanics, and Stock Breeders' Association	Jonesville	Hillsdale	W. T. Baxter	G. C. Munro	E. O. Grosvener	200	1860	......
German Agricultural and Horticultural Society	Lansing	Ingham	Ernest Heildt	J. Baumgrass	P. Kraus	10	1866	......
Hartland Farmers' Club	Hartland	Livingston	E. J. Hardy	I. D. Crouse	E. G. Smith	84	1867	30
Plymouth Farmers and Mechanics' Club	Plymouth	Wayne	H. O. Hanford	T. T. Lyon	....	40	1856	......
Volinia Farmers' Club	Volinia	Cass	M. J. Gard	H. S. Rogers	I. N. Gard	40	1865	......
Union Farmers' Club	Marshall	Calhoun	I. Hammond	L. S. Hammond	W. P. Slant	20	1867	......
Horticultural.								
Adrian Horticultural Society	Adrian	Leenawee	A. Sigler	J. Helmes	W. Owen	35	1851	141
Ladies' Horticultural and Industrial Association	Battle Creek	Calhoun	Mrs. G. Beardsley	Mrs. E. A. Tomlinson	Mrs. H. G. Champion	240	1866	......
Lake Shore Horticultural Association	Spring Lake	Ottawa	J. H. Newcomb	W. G. Sinclair	G. Seagrove	98	1866	......
MINNESOTA.								
COUNTY SOCIETIES.								
Agricultural.								
Blue Earth County Agricultural Society	Mankato	Blue Earth	H. W. Perry	Daniel Buck	Miles Porter	200	1859	......
Brown County Farmers' Association	New Ulm	Brown	Ig. Rinauts	Jno. Kaula	H. Mandefeld	12	1864	7
Carver County Agricultural Society	Carver	Carver	H. F. Henning	H. F. Henning	E. Rensfer	32	1856	......
Faribault County Agricultural Society	Winnebago City	Faribault	L. W. Brown	J. H. Welch	A. Bonwell	50	1858	......
Fillmore and Mower County Agricultural Society	Spring Valley	Fillmore	Wm. Chatfield	L. W. Allen	I. N. Cnmmings	40	1855	......
Freeborn County Agricultural Society	Albert Lea	Freeborn	E. C. Stacy	Samuel Eaton	Samuel Eaton	50	1861	......
Goodhue County Agricultural Society	Red Wing	Goodhue	Emery Purdy	T. R. Brill	Wm. Featherstone	100	1863	......
Hennepin County Agricultural Society	Minneapolis	Hennepin	G. W. Irwin	D. W. Albaugh	O. B. King	15	1853	......
Houston County Agricultural Society	Caledonia	Houston	D. L. Buell	N. E. Dorival	D. N. Gates	15	1867	......
Le Sueur County Agricultural Society	Cleveland	Le Sueur	A. K. Maynard	W. H. Hall	R. G. Rhodes	90	1866	......
Monongalia County Agricultural Association	Burbank	Monongalia	James Tuttle	J. L. Whitla	C. E. Lien	100	1866	......
Mower County Agricultural Society	Lansing	Mower	A. B. Vaughan	P. D. Vaughan	S. Smith	80	1863	......
Olmsted County Agricultural Society	Rochcester	Olmstead	B. F. Perry	J. A. Leonard	H. Loomis	....	......	......
Rice County Agricultural Association	Faribault	Rice	Chas. Wood	R. A. Mott	R. A. Mott	140	1857	......
Sibley County Agricultural Society	Henderson	Sibley	J. C. Stower	N. E. Nelson	Adam Buck	157	1863	(*)
Watonwan County Agricultural Society	Madelia	Watonwan	S. P. Driggers	W. W. Murphy	A. J. Nicholson	16	1866	......

TOWNSHIP SOCIETIES.

Agricultural.

Crow River Agricultural Society	Rockford	Wright	Wm. Sleight	D. R. Farnham	R. W. Currier	46	1860	......
Faribault Fruit Growers' Club	Faribault	Rice	R. A. Mott	A. McKinstry	L. Ruggles	27	1867	......
Farmers' Club of Rolling Stone	Minnesota City	Winona	C. C. Chapman	R. Pike, jr	E. Chapman	43	1866	76
Farmers' Club of School District No. 31	Stockton	Winona	Oct. Church	J. Delworth	John Hart	30	1867	......
Forestville Farmers' Club	Forestville	Filmore	Hon. W. Meighan	J. N. Graling	Hon. M. J. Foster	....	1868	......
Goodhue Farmers' Club	Goodhue	Goodhue	Francis Tether	H. Lowater	T. M. Lowater	116	1866	200
Hillsdale Agricultural and Horticultural Society	Stockton	Winona	Jabez Churchill	Jno. A. Moore	J. H. Lock	30	1867	......
Kelso and Sibley Agricultural Society	Sibley	Sibley	A. Delger	A. Delger	T. F. Phillips	50	1861	20
Lake Prairie Agricultural Society	St. Peter	Nicolet	Bernard Fay	Thos. Hughes	D. Croner	20	1868	......
Minnesota Lake Agricultural Society	Minnesota Lake	Faribault	John Stephenson	O. W. Slafter	E. E. Warren	26	1865	(*)
Pleasant Valley Farmers' Club	Cannon Falls	Goodhue	John Ryding	Jno. Greaves	J. W. Gray	12	1867	(*)
Rosemount and Lebanon Union Club	Rosemount	Dakota	M. H. Sullivan	Jno. Gilman	E. W. Felton	26	1867	......
Shieldsville Agricultural Club	Shieldsville	Rice	Joseph Hagerty	A. Delaney	J. Hagerty	104	1863	......
Union Agricultural Society	Smithfield	Wabashaw	C. G. Dawley	B. C. Leveridge	John Mullins	45	1863	12
Waconia Agricultural Club	Waconia	Carver	F. Hassenstab	Louis Gotthelf	J. Behrenfeld	12	1863	......
Warsaw Farmers' Club	Warsaw	Rice	D. M. West	C. de Bruyn Kops	Geo. Daws	30	1868	......
Wells Agricultural and Horticultural Club	Faribault	Rice	Thomas Kirk	J. R. Brown	Thos. Owings	62	1866	......

MISSISSIPPI.

TOWNSHIP SOCIETY.

Agricultural.

Sardis Agricultural and Mechanical Society	Sardis	Panola	J. F. Simmons	R. W. Crump	W. H. Wall	56	1868	......

MISSOURI.

COUNTY SOCIETIES.

Agricultural.

Boone County Agricultural and Mechanical Association	Columbia	Boone	J. S. Clarkson	J. M. Samuel	J. C. Orr	140	1852	......
Callaway County Agricultural Society	Fulton	Callaway	C. A. Bailey	Isaac D. Snedecon	W. H. Bailey	125	1855	......
Cass County Agricultural and Mechanical Association	Harrisonville	Cass	J. Thompson	W. J. Terrell	J. H. Williams	93	1867	......
Clark County Agricultural Society	Ashton	Clark	C. W. Meyhew	O. F. Ensign	J. T. Caldwell	65	1852	......
Clay County Agricultural and Mechanical Association	Liberty	Clay	M. Miller	A. J. Calhoun	J. G. Adkins	256	1854	153
Cole County Agricultural and Mechanical Association	Jefferson City	Cole	J. T. Rogers	J. C. Watson	C. F. Lohman	9	1859	......
Gentry County Agricultural Society	Albany	Gentry	I. N. Morris	C. G. Comstock	M. M. Embrie	185	1866	......
Howard County Agricultural and Mechanical Society	Fayette	Howard	J. F. Williams	C. H. Stewart	J. M. Marmaduke	300	1857	......
Jefferson County Agricultural and Mechanical Association	Pevely	Jefferson	D. W. Bryant	Wm. S. Jewett	L. J. Rankin	75	1866	......
Lawrence County Agricultural and Mechanical Society	Mount Vernon	Lawrence	J. D. Allen	J. H. Woods	W. W. Wright	107	1867	......
Montgomery County Agricultural and Mechanical Society	High Hill	Montgomery	Jacob See	S. S. Nolin	D. F. Knox	108	1857	......
Pike County Agricultural and Mechanical Society	Ashley	Pike	W. K. Biggs	W. H. Purse	S. A. Bryant	150	1867	......
Schuyler County Agricultural and Mechanical Society	Greentop	Schuyler	D. Wells	John B. Glaze	Jacob Miller	175	1859	......
Warren County Agricultural and Mechanical Society	Warrenton	Warren	I. E. Yocum	C. E. Peers	G. Schnick	100	1867	......
Washington County Joint Stock Agricultural and Mechanical Society.	Potosi	Washington	G. B. Cole	G. B. Clark	W. T. Hunter	63	1867	......
Webster County Agricultural and Mechanical Society	Marshfield	Webster	E. W. Barns	W. J. Bodenhamer.	E. W. Young	....	1868	......

* Reports.

List of county and township agricultural and horticultural societies, &c.—Continued.

Societies.	Post office address of secretary.	County.	President.	Secretary.	Treasurer.	No. of members.	Date of organization.	No. of volumes in library.
Horticultural.								
Jefferson County Horticultural Society	Hillsboro	Jefferson	T. Walker	J. E. Walker	H. P. Bates	75	1865	100
TOWNSHIP SOCIETIES.								
Agricultural.								
Diamond Grove Farmers' Club	Granby	Newton	J. C. Mitchell	Henry Swain	W. S. Bartholomew	27	1867	(*)
Lafayette Agricultural and Mechanical Association	Lexington	Lafayette	T. M. Ewing	J. M. McGirk	Robert Hall	97	1867	......
Literary Society and Farmers' Club	May View	Lafayette	S. Stoughton	W. F. Gordon	Wm. Price	75	1867	125
Mississippi Valley Grape Growers' Association	Fox Creek	St. Louis	C. W. Spaulding	Wm. Muir	J. H. Tice	90	1867	......
Northeastern Agricultural Society	Paris	Monroe	A. Grimes	A. M. Alexander	E. M. Poage	300	1856	......
Osage Farmers' Club	Oshawa	Osage	D. Comstock	D. A. Waters	M. A. Fleck	25	1863	......
St. Louis Agricultural and Mechanical Association	St. Louis	St. Louis	A. B. Barrett	G. O. Kalb	B. C. Sandford	626	1856	......
Southwestern Agricultural Society	Springfield	Green	C. B. Holland	L. A. Newton	J. W. D. L. F. Mack	300	1865	......
Horticultural.								
German Horticultural Society	St. Louis	St. Louis	W. D'Oench	T. Pfau	Chas. Beyer	150	1863	......
Kansas City Horticultural Society	Kansas City	Jackson	N. Holmes	S. W. Salisbury	J. S. Boreman.	22	1863	23
Northeast Missouri Horticultural Society	Hannibal	Marion	A. E. Trabue	W. L. Youse	J. Turner	50	1864	......
St. Louis Horticultural Society	St. Louis	St. Louis	J. J. Kelley	C. W. Murtfeldt	C. W. Murtfeldt	......	1868	......
NEBRASKA.								
COUNTY SOCIETIES.								
Agricultural.								
Cass County Farmers' Club	Plattsmouth	Cass	S. Maxwell	W. S. West	D. Mutts	50	1861	......
Douglas County Agricultural Society	Omaha	Douglas	L. A. Walker	B. E. B. Kennedy	A. D. Jones	91	1858	......
Merrick County Agricultural Society	Brewers' Ranch	Merrick	J. Parker	J. L. Martin	W. Brewer	31	1865	(*)
Nemeha County Agricultural Society	Brownsville	Nemeha	R. W. Furnas	H. O. Minnick	S. W. Kennedy	1,200	1859	500
Otoe County Farmers' Club	Nebraska City	Otoe	Wm. Buchanan	H. K. Raymond	D. M. Martin	18	1868	......
Richardson County Agricultural Society	Salem	Richardson	J. R. Brook	D. A. Tisdel	F. A. Tisdel	90	1867	(*)

TOWNSHIP SOCIETIES.								
Agricultural.								
Camp Creek Farmers' Club	Nebraska City	Otoe	J. Fitchie	J. Wright	J. Hayes	19	1866	(*)
Nemeha Agricultural Society	Arago	Richardson	C. F. Walther	G. Duerfeldt	W. Ziemendorf	30	1861	......
NEVADA.								
TOWNSHIP SOCIETY.								
Agricultural.								
Pah ranagat Farmers' Club	Hiko	Lincoln	C. P. Ely	C. W. Wandell	M. H. Carlow	6	1867	......
NEW HAMPSHIRE.								
COUNTY SOCIETIES.								
Agricultural.								
Cheshire County Agricultural Society	Keene	Cheshire	Wm. Haile	T. E. Hatch	T. H. Leverett	500	1854	......
Grafton County Agricultural Society	Lyme	Grafton	C. Brackett	E. K. Porter	Chas. Kent	....	1848	......
Hillsborough County Agricultural and Mechanical Ass'n	Milford	Hillsborough	Abel Chase	John L. Spring	Jno. L. Spring	200	1850	102
Merrimack County Agricultural Society	Concord	Merrimack	M. Humphrey	J. E. Pecker	I. K. Gage	377	1824	......
Rockingham County Agricultural Society	Exeter	Rockingham	J. F. W. Hobbs	S. S. Thyng	W. B. Morrill	900	1852	......
TOWNSHIP SOCIETIES.								
Agricultural.								
Concord Agricultural and Library Association	Concord	Merrimack	J. B. Walker	M. H. Bradley	T. S. Crawford	30	1862	97
Exeter Agricultural and Horticultural Society	Exeter	Rockingham	W. P. Moulton	J. I. Bell	G. Gilmer	225	1866	......
Hampton Farmers' Club	Hampton Falls	Rockingham	N. P. Crain	C. A. Nason	E. Prescott	38	1853	92
Loudon Centre Farmers' Club	Loudon Centre	Merrimack	H. J. Osgood	J. J. M. Tenney	....	62	1864	......
Pittsfield Agricultural Society	Pittsfield	Merrimack	Porter C. True	S. J. Winslow	....	30	1861	(*)
NEW JERSEY.								
COUNTY SOCIETIES.								
Agricultural.								
Burlington County Agricultural Society	Mount Holly	Burlington	H. J. Irick	G. C. Brown	F. B. Leris	166	1846	......
Cumberland County Agricultural and Horticultural Soci'y	Bridgeton	Cumberland	H. Ogden, jr	D. McBride	D. McBride	324	1852	......
Gloucester County Agricultural Society	Woodbury	Gloucester	John Haines	A. M. Wilkins	C. Knight	150	1858	......
Middlesex County Farmers' Club	New Brunswick	Middlesex	J. S. Voorhees	Paul Cook	G. W. Steele	36	1867	......
Monmouth County Agricultural Society	Freeland	Monmouth	R. A. Leonard	J. C. Smock	C. A. Bennett	300	1858	......
Morris County Farmers and Mechanics' Club	Morristown	Morris	A. J. Smith	S. F. Headley	L. B. Cobb	46	1867	......
Somerset County Farmers' Club	Somerville	Somerset	H. G. Garretson	C. M. Jameson	L. R. Bredenburg	21	1867	......

* Reports.

List of county and township agricultural and horticultural societies, &c.—Continued.

Societies.	Post office address of secretary.	County.	President.	Secretary.	Treasurer.	No. of members.	Date of organization.	No. of volumes in library.
TOWNSHIP SOCIETIES.								
Agricultural.								
Atconian Social Agricultural Society	Atco	Camden	Henry A. Green	G. W. Hancock	W. O. Talcott	31	1867	150
Burlington Farmers' Club	Burlington	Burlington	C. L. Spaulding	S. P. Bulter	Henry Cooper	36	1866	20
Bricksburg Farmers' Club	Bricksburg	Ocean	M. Chase	H. H. Jones	T. Leavenworth	56	1866	......
Central Agricultural Association	Egg Harbor City	Atlantic	T. T. Fritschy	L. Bullinger	F. Schen	21	1863	......
East Vineland Agricultural and Pomological Society	East Vineland	Cumberland	W. F. Hays	Walter Scott	D. A. Forbes	20	1866	......
Egg Harbor City Agricultural Association	Egg Harbor City	Atlantic	Daniel Haz	F. Schen	C. Grimer	60	1858	20
Farmers and Mechanics' Club	Jamesburg	Middlesex	J. C. Magee	W. M. Wells	J. H. Heath	22	1856	50
Farmers and Mechanics' Club	New Market	Middlesex	David Dunn	H. B. Baker	A. S. Coriel	46	1856	......
Forest Grove Horticultural and Agricultural Society	Forest Grove	Gloucester	Chas. Young	Wm. Shirress	Daniel Duroc	57	1867	100
Fruit Growers' Club	South Vineland	Cumberland	C. W. Kilbourn	M. M. Gillam	L. Fish	40	1866	190
Gloucester Farmers' Club	Egg Harbor City	Atlantic	L. V. Oslooski	......	L. Baier	21	1867	(*)
Hammonton Pomological Society	Hammonton	Atlantic	Hiram Crowell	G. Valentine	M. Parkhurst	100	1864	......
Metuchen Agricultural and Horticultural Society	Metuchen	Middlesex	A. Marshall	E. M. Hunt	C. Cathcart, sen	30	1867	......
Progressive Farmers' Club	Mount Laurel	Burlington	A. M. Risdon	R. B. Engle	M. H. Brozby	92	1865	20
School District No. 9 Agricultural Society	Egg Harbor City	Atlantic	E. Rawber	G. Gunther	J. Kingle	40	1865	12
Vineland Agricultural and Horticultural Society	Vineland	Cumberland	P. Snyder	C. B. Campbell	M. C. Crocker	200	1863	94
Horticultural.								
Paterson Horticultural Association	Paterson	Passaic	James Shaw	Wm. Brooks	H. Wilkinson	31	1849	(*)
NEW YORK.								
COUNTY SOCIETIES.								
Agricultural.								
Albany County Agricultural and Industrial Society	Albany	Albany	Henry Creble	D. DeGraff	John McHarg	188	1867	......
Alleghany County Agricultural Society	Angelica	Allegany	S. H. Whitcomb	Daniel D. Gardiner	James Lockhart	229	1843	......
Broome County Agricultural Society	Binghamton	Broome	Oliver C. Crocker	Harris G. Rogers	Wm. E. Taylor	50	......	......
Cattaraugus County Agricultural Society	Little Valley	Cattaraugus	Chauncey A. Snow	Horace S. Huntly	Erastus N. Lee	91	1841	40
Cayuga County Agricultural and Horticultural Society	Auburn	Cayuga	Allen D. Morgan	A. B. Hamblin	L. C. Mann	510	1841	......
Chenango County Agricultural Society	Norwich	Chenango	Hiram Hale	Girad S. Mead	T. D. Miller	700	1843	......
Clinton County Agricultural Society	Plattsburgh	Clinton	John W. Bailey	Robert Bailey	Jonathan T. Heyer	325	1841	......
Columbia County Agricultural Society	Chatham Four C'rs.	Columbia	Steph'n G. Bushnell	Ab. Ashley, jr	J. Wesley Jones	141	1841	......
Cortland County Agricultural Society	Cortlandville	Cortland	Alf. L. Chamberlain	P. Bacon Davis	Morgan L. Webb	250	1838	100

Delaware County Agricultural Society	Delhi	Delaware	Wm. B. Dowie	Porter Fridler	G. W. Hanford	241	1839	......
Franklin County Agricultural Society	Malone	Franklin	Clinton Stevens	William G. Richey	M. S. Malon	800	1856	......
Fulton County Agricultural Society	Johnstown	Fulton	Henry R. Snyder	John J. Davidson	Nathan P. Wells	100	1865	......
Genesee County Agricultural Society	Batavia	Genesee	Addison Foster	Orlo R. Clark	Jerome Thompson	829	1840	......
Greene County Agricultural Society	Acra	Greene	Peter P. Snyder	Geo. W. Russ	E. E. Derby	200	1856	......
Herkimer County Agricultural Society	Mohawk	Herkimer	Ezekiel Spencer	Eli Fox, M. D	Isaac Quackingbush	1,474	1841	......
Jefferson County Agricultural Society	Watertown	Jefferson	Daniel Green	A. P. Sigourney	Willard Ives	1,098	1817	......
Lewis County Agricultural Society	Lowville	Lewis	Emery Allen	F. B. Morse	C. G. Riggs	36	1820	......
Livingston County Agricultural Society	Geneseo	Livingston	W H. Spencer	W. A. Brodie	Kidder M. Scott	248	1855	......
Monroe County Agricultural Society	Rochester	Monroe	John G. Klinck	M. D. Rowley	L. D. Mitchell	690	1840	......
Niagara County Agricultural Society	Lockport	Niagara	Alex. Campbell	John E. Pound	Edward Simmons	450	1848	......
Oneida County Agricultural Society	Clinton	Oneida	Oscar B. Gridley	Roderick Morrison	Joseph M. Stebbins	700	1840	......
Ontario County Agricultural Society	Canandaigua	Ontario	Stephen A. Codding	J. B. Smith	L. B. Gaylord	1,657	1854	......
Orleans County Agricultural Society	Albion	Orleans	Hezekiah Bowen	Samuel W. Smith	Cyrus Farwell	650	1855	......
Oswego County Agricultural Society	Oswego	Oswego	Morgan L. Marshall	Henry L. Davis	Luther H. Conklin	1,094	1840	......
Putnam County Agricultural Society	Croton Falls	Putnam	D. D. Chamberlain	George W. Gregory	Ambrose Ryder	182	1850	......
Queens County Agricultural Society	Hempstead	Queens	Peter C. Barnum	John Harold	John Harold	630	1841	......
Rensselaer County Agricultural Society	Troy	Rensselaer	Burton A. Thomas	Chas. E. Davenport	Elisha Waters	326	1841	200
St. Lawrence County Agricultural Society	Canton	St. Lawrence	A. B. James	James S. Orr	Ebenezer Miner	71	1852	......
Saratoga County Agricultural Society	Saratoga Springs	Saratoga	Frank D. Curtis	J. A. Corey	Miles J. Jennings	200	1841	......
Schoharie County Agricultural Society	Schoharie	Schoharie	Tobias Bouck	I. C. Van Tuyl	Ralph Brewster	290	1860	......
Schuyler County Agricultural Society	Watkins	Schuyler	E. C. Frost	E. Ingalls	J. W. Thompson	500	1855	......
Steuben County Agricultural Society	Bath	Steuben	Robert B. Wilkes	Reuben E. Robie	George W. Hallock	560	1853	70
Tioga County Agricultural Society	Owego	Tioga	N. K. Warring	T. T. Chatfield	D. J. Bloodgood	300	......	......
Ulster County Agricultural Society	Glasco	Ulster	James Kiersterd	P. H. Brink	C. Burhans	250	1867	......
Washington County Agricultural Society	South Hartford	Washington	John N. Williams	Milo Ingalsbe	William M. Holmes	13	1839	......
Washington County Sheep-breeders and Wool-growers' Association.	Comstock's Landing	Washington	H. W. Beckwith	I. V. Baker	B. J. Laurence	300	1865	......
Wayne County Agricultural Society	Lyons	Wayne	James M. Bradley	John L. Cole	W. D. Perrine	170	1856	100
Westchester County Agricultural Society	White Plains	Westchester	Warren Leland	John Cowan	N. Holmes Odell	200	1843	......
Yates County Agricultural Society	Penn Yan	Yates	Thomas J. Lewis	George Y. Eastman	O. G. Sherman	......	......	......

TOWNSHIP SOCIETIES.

Agricultural.

Afton Agricultural Society	Afton	Chenango	Peter L. Merritt	G. M. Champlin	J. C. Chamberlain	138	1859	......
Allen Settlement Farmers' Club	Maine	Broome	Ezra J. Councilman	Spencer S. Allen	Spencer S. Allen	20	1862	75
Bainbridge Agricultural Society	Bainbridge	Chenango	John Banks	Joseph Julian, sec'd.	Joseph Julian, sec'd.	125	1857	(*)
Bay Ridge Agricultural Society	Bay Ridge	Kings	Henry C. Murphy	B. C. Townsend	B. C. Townsend	30	1863	220
Bedford Farmers' Club	Mt. Kisco	West Chester	John D. Haines	James Wood	Henry Wood	43	1851	72
Brookfield Agricultural Society	Brookfield	Madison	Thomas R. Gorton	Wm. N. Stillman	A. W. Mowrey	300	1849	......
Castle Creek Farmers' Club	Castle Creek	Broome	Isaac Emons	S. F. Black	J. Gayloe	40	......	35
Catherine Farmers' Club	Catherine	Schuyler	L. W. Frost	Jesse Lyon	S. C. Beardsley	21	1862	......
Chautauqua Farmers and Mechanics' Club	Fredonia	Chautauqua	L. L. Hyde	John S. Russell	J. B. Miner	192	1859	......
Clayton German Agricultural Club	Depauville	Jefferson	George Poth	Henry Haas		12	1868	......
Conewango Valley Union Agricultural Society	East Randolph	Cattaraugus	F. C. Hovey	M. Van Benson	J. V. Goodwill	200	1858	......
Constantia Agricultural Society	Constantia	Oswego	James Dickie	Fred. C. Lander	Jerome Taylor	410	1857	......
Crown Point and Bridport Farmers and Mechanics' Association.	Crown Point	Essex	Chauncey Fenton	H. H. Havens	J. W. Wyman	550	1864	......
Dundee Union Agricultural Society	Starkey	Yates	D. Disbrow	J. E. Gano	U. Hair	1,000	1855	(†)
Essex and Willsboro' Agricultural Society	Essex	do.	A. B. Morhous	A. A. Morse	G. W. Palmer	215	1859	......

* Reports. † None.

List of county and township agricultural and horticultural societies, &c.—Continued.

Societies.	Post office address of secretary.	County.	President.	Secretary.	Treasurer.	No. of members.	Date of organization.	No. of volumes in library.
Farmingdale Farmers' Club	Farmingdale	Queens	Wm. C. Dupignac	Chas. Hendrickson	Gilbert Baldwin	40	1864	20
Farmers' Club of Greece	Greece	Monroe	L. P. Langworthy	F. W. Lay	F. W. Lay	65	1858	......
Farmers' Club of Little Falls	Little Falls	Herkimer	Harris Lewis	X. A. Willard	Chas. Oyston	300	1857	200
Farmers' Club of Skaneateles	Skaneateles	Onondaga	Wills Clift	Emerson H. Adams	Wm. J. Townsend	75	1854	200
Farmers' Club of St. Johnsville	Crum Creek	Fulton	......	E. G. Stormst	......	20	1860	......
Farmers and Mechanics' Club, Hicksville	Hicksville	Queens	Benjamin Page	Stephen Wallace	Balthazer Hoffman	35	1865	50
Farmers and Mechanics' Club of Onondaga	Onondaga Valley	Onondaga	Luke Wells	Wm. Sabine	C. C. Marlett	32	1867	......
Farmers and Gardeners' Club of Pomfret	Fredonia	Chautauqua	Ira Porter	Almond Z. Madison	A. Z. Madison	50	1856	43
Farmers' Club of District No. 8	Penn Yan	Yates	George A. Travis	S. S. Scutt	Geo. Dusenberry	49	1863	......
Farmers' Club of East Maine	East Maine	Broome	Ab'm H. Greene	Robert Hogg	Robert Hogg	26	1858	80
Fruit-growers' Association of Pleasant Valley	Hammondsport	Steuben	T. M. Younglove	H. D. Rose	A. J. Switzer	200	1858	......
German Agricultural and Horticultural Society	Olean	Cattaraugus	Jacob Cook	Wm. Arnd	Michael Schenderle	21	1861	50
Gouverneur Agricultural and Mechanical Society	Gouverneur	St. Lawrence	Peleg Chamberlain	W. H. Walling	W. H. Walling	300	1859	......
Hamilton Agricultural and Mechanical Association	Poolville	Madison	C. F. Rhoades	O. B. Lord	D. B. West	100	1856	......
Hammond Union Agricultural and Mechanical Society	North Hammond	St. Lawrence	David Gregor	C. A. Wooster	Irenus Franklin	255	1860	......
Harpersville Union Agricultural Society	Harpersville	Broome	Edward Harper	Martin Ruggles	S. S. Doolittle	300	1859	......
Hess Road Farmers' Club	Hess Road	Niagara	M. M. McIntosh	J. S. Woodard	A. E. Perrigo	150	1864	180
Independence Rural Agricultural Society	Shongo	Allegany	Clark White	A. Kelsey	W. W. Wilson	108	1854	......
Ithaca Farmers' Club	Ithaca	Tompkins	Ezra Cornell	N. Crittenden	O. B. Curran	200	1848	1,000
Lodi Agricultural Society	Lodi	Seneca	Peter E. Van Vleet	C. B. Vescelius	M. B. Ellison	200	1857	......
Lysander and Van Buren Farmers' Club	Baldwinsville	Onondaga	Rufus Sears	A. H. Toll	A. Cunningham	30	1862	......
Manlius and Pompey Agricultural and Mechanical Ass'n	Manlius	do.	George Butts	Wm. M. Smith	Porter Tremain, jr.	185	1859	......
Moriah Agricultural Society	Port Henry	Essex	Walter Merrill	G. T. McKenzie	Thomas Walton	150	1859	......
New Paltz Agricultural Society	New Paltz	Ulster	Daniel L. Heaton	E. Van Wagener	J. J. Hasbrouck	18	1866	......
North Settlement Farmers' Club	Odessa	Schuyler	J. F. Hopkins	G. C. Thompson	Munson Prince	87	1858	......
Oswego Falls Agricultural Society	Fulton	Oswego	Robert Oliver	Wm. C. Stevens	Robert C. Kinyon	1,875	1862	......
Otisco Farmers' Club	Amber	Onondaga	M. W. Hotchkiss	James L. Niles	J. H. Redway	54	1860	100
Ridgeway Agricultural and Horticultural Club	Ridgeway	Orleans	Julius Harris	George L. Pratt	......	40	1867	......
Riverhead Agricultural Society	Success	Suffolk	H. F. Luce	S. Terry Hudson	S. O. Benjamin	38	1867	80
Rosendale Farmers' Club	Rosendale	Ulster	Hiram Hasbrook	S. P. Keator	Peter D. Lefever	120	1860	......
Schenevus Valley Agricultural Society	Schenevus	Otsego	James McKown	W. W. Cone	Jas. M. Thompson	91	1865	......
Seneca Falls Union Agricultural Society	Seneca Falls	Seneca	Leroy C. Partridge	John Cuddeback	A. M. Van Cleff	60	1861	......
Sing Sing Agricultural and Mechanical Association	Sing Sing	Westchester	George T. Houston	Charles R. Quick	Marcus A. Oliver	43	1867	240
Sullivan Farmers and Mechanics' Club	Chittenango	Madison	P. D. Harrington	Thomas Dickinson	Thomas Dickinson	100	1852	......
Susquehanna Valley Agricultural Society	Unadilla	Otsego	Jas. R. Blackman	George B. Fellows	Andrew J. Sands	850	1866	......
Thorn Hill Farmers' Club	Thorn Hill	Onondaga	Silas A. Wright	Allen Brown	Shepard Earl	20	1862	30
Tonawanda Valley Agricultural Society	Attica	Wyoming	Hiram Cooley	C. Houghton	G. Dorrance	500	1856	325
Trenton Union Agricultural Society	North Gage	Oneida	Walter Fowler	George King	D. W. Rhodes	600	1860	......
Union Agricultural Society	Hume	Allegany	Wm. R. Mills	C. N. Flenagin	Miles W. Weaver	......	1851	

Union Agricultural Society	Springfield	Erie	E. Wright	B. Chafee	Pliny Smith	150	1858	75
Union (of Palmyra) Agricultural Society	Palmyra	Wayne	Wm. P. Nottingham.	Chas. D. Johnson	Luther M. Chase	240	1856	......
Union Farmers' Club	Utica	Oneida	Dr. L. L. Wight	A. B. Tuttle	H. N. Porter	13	1868	(‡)
Vernon Agricultural Society	Vernon	Oneida	Harlem Norton	L. A. Griswold	L. A. Griswold	100	1848	......
Verona Farmers' Club	Verona	...do.	Gardner B. Weeks.	James H. Foster	Wm. S. Dodge	40	1868	......
Victory Agricultural Society	Victory	Cayuga	David S. Woodford.	Daniel L. Halsey	John F. Gregory	200	1853	......
Westbury Farmers' Association	North Hempstead	Queens	....	Edward Hicks	Samuel Hicks	38	1864	9
Horticultural.								
Horticultural, Pomological, and Floral Society of the First Assembly District of Washington County.	Cambridge	Washington	Henry C. Gray	Joseph D. Stowart.	Azor Culver	72	1866	......
Le Roy Horticultural Society	Le Roy	Genesee	C. B. Thompson	James E. Hazleton.	James E. Hazleton.	60	1863	25
Naples Horticultural Society	Naples	Ontario	J. B. Johnson	S. H. Sutton	C. W. Fox	25	1857	12
Newburg Bay Horticultural Society	Newburg	Orange	H. W. Sargent	W. L. Findlay	Daniel Smith	150	1862	56
Oswego Horticultural Society	Oswego	Oswego	Benjamin Doolittle.	Henry L. Davis	Henry Gleason	200	1848	300
NORTH CAROLINA.								
TOWNSHIP SOCIETIES.								
Agricultural.								
New Garden Agricultural Society	New Garden	Guilford	Levin Kirkman	Uriah Macy	Jonathan E. Cox	47	1868	......
New Market Agricultural Association	New Market	Randolph	Newton Newlin	David Farlow	Franklin Gardner	42	1868	......
Providence Farmers' Club	Providence	Mecklenberg	E. C. Kuykendal	J. S. Reid	J. E. Sample	25	1867	......
Randolph Agricultural Club	New Market	Randolph	Wash'n S. Blair	Nathan F. Spencer.	Obed Osborn	45	1867	......
OHIO.								
COUNTY SOCIETIES.								
Agricultural.								
Ashtabula County Agricultural Society	Jefferson	Ashtabula	Wm. Jarvis, second.	E. J. Betts	E. C. Wade	239	1846	......
Athens County Agricultural Society	Athens	Athens	George Putnam	George W. Baker	N. H. Van Vorhees.	300	1851	......
Belmont County Agricultural Society	St. Clairsville	Belmont	Isaac Welsh	R. H. Cochran	Ross J. Alexander	425	1847	......
Brown County Agricultural Society	Georgetown	Brown	A. M. Ellsberry	W. T. Galbraith	C. F. King	554	1850	......
Brown County Industrial Association	Ripley	...do.	Cyrus Howard	S. W. Espey	J. M. Snider	400	1856	......
Butler County Agricultural Society	Millville	Butler	Fergus Anderson	W. R. Cochran	James Giffin	1,000	1850	......
Carroll County Agricultural Society	Carrollton	Carroll	Elisha McGuire	Robert Raley	Wm. Thompson	640	1850	......
Clarke County Agricultural Society	Springfield	Clarke	Peter Sintz	D. Thatcher	James Bacon	450	1852	100
Clermont County Agricultural Society	Batavia	Clermont	W. E. Mears	Frank Browning	Samuel Titus	1,000	1848	......
Columbiana County Agricultural Society	New Lisbon	Columbiana	John Spence	John A. Myers	James Scott	400	1846	......
Crawford County Agricultural Society	Bucyrus	Crawford	J. Koler	J. R. Clymer	J. B. Gormley	380	1867	......
Cuyahoga County Agricultural Society	Cleveland	Cuyahoga	J. M. Hickox	S. D. Harris	B. H. Stair	350	1836	......
Darke County Agricultural Society	Greenville	Darke	G. W. Studabaker	John E. Matchett	Noah Arnold	995	1854	150
Defiance County Agricultural Society	Defiance	Defiance	Thomas Elliott	Joseph Ralston	Brice Hilton	104	1855	......
Erie County Agricultural Society	Sandusky	Erie	D. C. Richmond	J. N. Chamberlain	A. W. Prout, jr.	571	1855	......
Fairfield County Agricultural Society	Lancaster	Fairfield	James Stockdale	John G. Reeves	John C. Weaver	1,256	1851	......
Fayette County Agricultural Society	Washington C. H.	Fayette	James Pursell	M. Willard	D. Frutwangler	129	1867	......

* Agricultural Reports. † The only officer elected annually ‡ None.

List of county and township agricultural and horticultural societies, &c.—Continued.

Societies.	Post office address of secretary.	County.	President.	Secretary.	Treasurer.	No. of members.	Date of organization.	No. of volumes in library.
Franklin County Agricultural Society	Columbus	Franklin	D. L. Holton	C. S. Glenn	John M. Pugh	1,500	1852	......
Franklin County Farmers' Club	...do.	...do.	J. O. B. Renick	J. H. Klippart	J. W. Dwyer	60	1868	......
Fulton County Agricultural Society	Ottokee	Fulton	D. W. H. Howard	T. H. Brown	A. B. Canfield	273	1858	......
Gallia County Agricultural Society	Gallipolis	Gallia	E. A. Stone	Isaac R. Callahan	W. C. Hayward	120	1853	......
Geauga County Agricultural Society	Burton	Geauga	Peter Hitchcock	H. C. Tuttle	George Boughton	356	1831	......
Geauga County Free Agricultural Society	Claridon	...do.	Lewis G. Maynard	L. T. Wilmot	E. C. Belding	150	1853	......
Greene County Agricultural Society	Xenia	Greene	Daniel McMillan	A. L. Trader	John Leaman	750	1840	......
Guernsey County Agricultural Society	Cambridge	Guernsey	Hugh Broom	C. P. B. Sarchet	Alex. McCracken	167	1849	......
Guernsey County Industrial Association	Washington	...do.	E. Creighton	Wm. A. Lawrence	J. M. Patterson	600	1858	......
Hamilton County Agricultural Society	Montgomery	Hamilton	Wm. McKelvey	J. E. Brown	H. P. Bonham	383	1849	......
Hancock County Agricultural and Industrial Society	Findley	Hancock	A. W. Frederick	D. B. Beardsley	G. C. Barnd	370	1851	......
Hardin County Agricultural Society	Kenton	Hardin	James M. White	R. F. McConnell	W. D. Dean	114	1851	......
Henry County Agricultural Society	Napoleon	Henry	J. A. Stout	A. H. Tyler	J. H. Tyler	175	1866	......
Highland County Agricultural Society	Hillsboro'	Highland	Wesley Copes	E. Arthur	R. W. Spargue	550	1849	......
Hocking County Agricultural Society	Logan	Hocking	W. M. Bowen	J. M. Floyd	J. C. Rochester	502	......	......
Holmes County Agricultural Society	Millersburg	Holmes	R. Wheaton	B. C. Brown	D. S. Uhl	200	1850	......
Jackson County Agricultural Society	Jackson C't House	Jackson	Greene Thompson	J. A. Sell	Wm. B. Steele	166	1854	......
Jasper County Wool-growers' Association	Newton	Jasper	Samuel L. Miller	A. Failor	F. Swyhart	30	1866	......
Knox County Agricultural Society	Mt. Vernon	Knox	G. B. Potwin	Alex. Cassell	J. D. Thompson	100	1854	......
Lake County Agricultural Society	Painesville	Lake	Harmon Carroll	D. W. Mead	Horace Steele	807	1850	......
Lawrence County Agricultural Society	Ironton	Lawrence	S. B. Hempstead	T. J. Murdock	J. M. Kelley	100	1854	......
Licking County Agricultural Society	Newark	Licking	William Veach	Isaac W. Bigelow	Waldo Taylor	1,100	1847	......
Logan County Agricultural Society	Bellefontaine	Logan	D. W. Harris	James Walker	......	813	1850	......
Lorain County Agricultural Society	Elyria	Lorain	Wm. A. Braman	I. S. Metcalf	I. S. Metcalf	815	1845	......
Lorain County Farmers' Club	...do.	...do.	R. Baker	T. S. Metcalf	T. S. Metcalf	76	1863	......
Lucas County Agricultural Society	Toledo	Lucas	H. Kellogg	A. Colgrove	Wm. Rawle	400	1853	......
Mahoning County Agricultural Society	Canfield	Mahoning	George Pow	Frank C. Nesbitt	J. W. Canfield	638	1847	......
Marion County Agricultural Society	Marion	Marion	E. Messenger	H. M. Ault	T. P. Wallace	120	1851	......
Medina County Agricultural Society	Medina	Medina	Wm. Bennett	N. H. Bostwick	S. B. Woodward	613	1845	......
Meigs County Agricultural Society	Pomeroy	Meigs	Abner Stout	Daniel A. Russell	H. B. Smith	200	......	......
Miami County Agricultural Society	Troy	Miami	W. H. H. Dye	W. H. Gahagan	C. H. Culbertson	672	1847	325
Monroe County Agricultural Society	Woodsfield	Monroe	H. R. Mason	John E. Hill	H. B. Hill	430	1851	......
Montgomery County Agricultural Society	Dayton	Montgomery	R. D. Harshman	M. Eells	James Applegate	350	1859	......
Morgan County Agricultural Society	McConnellsville	Morgan	Austin Dickey	John S. Adair	Frank Kahler	710	1852	......
Muskingum County Agricultural Society	Zanesville	Muskingum	Valentine Best	F. A. Seborn	Jas. Buckingham	300	1848	......
Noble County Agricultural Society	Sarahsville	Noble	Wm. J. Laughlin	Jonas Danforth	Wm. M. Stewart	325	1852	......
Paulding County Agricultural Society	Paulding	Paulding	R. M. Reid	F. S. Cable	W. N. Snook	49	1859	......
Portage County Agricultural Society	Ravenna	Portage	N. S. Olin	Frank Ford	C. W. Brainard	186	1845	......
Preble County Agricultural Society	Eaton	Preble	Hayden W. Dooley	James Albert	Joseph Fisher	1,628	1850	......

Richland County Agricultural Society	Mansfield	Richland	Alex. C. Welch	Geo. A. Clugston	M. E. Douglas	....	1850	......
Sandusky County Agricultural Society	Frémont	Sandusky	Platt Brush	John V. Beery	John P. Elderkin	365	1852	......
Scioto County Agricultural Society	Portsmouth	Scioto	L. Salladay	Sam'l F. Wetmore	Thomas Dugan	50	1868	......
Seneca County Agricultural Society	Tiffin	Seneca	E. F. Stickney	Geo. W. Buchanan	A. G. Sneath	....	1842	......
Shelby County Agricultural Society	Sidney	Shelby	John Duncan	J. Smythe Read	O. J. Taylor	205	1860	......
Stark County Agricultural Society	Canton	Stark	Levi Stump	Lewis Slusser	M. D. Harter	400	1849	......
Summit County Agricultural Society	Akron	Summit	J. P. Alexander	J. Starr	G. D. Bates	1,000	1850	......
Trumbull County Agricultural Society	Leavittsburg	Trumbull	D. Herrington	H. F. Austin	A. D. Webb	920	1847	......
Tuscarawas County Agricultural Society	Canal Dover	Tuscarawas	G. Ricker	E. F. Slingluff	G. B. Deardorff	800	1848	......
Union County Agricultural Society	Marysville	Union	J. W. Robinson	L. Piper	W. H. Robb	250	1846	......
Warren County Agricultural Society	Lebanon	Warren	J. N. Evans	G. W. Carey	Chas. A. Smith	1,800	1849	......
Washington County Agricultural and Mechanical Ass'n	Marietta	Washington	John Newton	Wm. B. Thomas	C. K. Leonard	600	1846	......
Wayne County Agricultural Society	Wooster	Wayne	I. N. Jones	C. S. Frost	David Clark	491	1849	......
Williams County Agricultural Society	Bryan	Williams	David Morrow	J. W. Smith	H. L. Walker	743	1856	......
Wood County Agricultural Society	Tontogany	Wood	Geo. Powers	M. Warner	J. W. Ross	92	1851	......
Wyandot County Agricultural Society	Upper Sandusky	Wyandot	John S. Rappe	H. A. Hoyt	J. A. Maxwell	250	1851	......
Horticultural.								
Montgomery County Horticultural Society	Dayton	Montgomery	N. Ohmer	Dr. R. Grundy	Robert W. Steele	54	1867	......
Warren County Horticultural Society	Lebanon	Warren	Dr. J. Scott	G. W. Frost	Charles A. Smith	46	1867	......
TOWNSHIP SOCIETIES.								
Agricultural.								
Ashtabula Farmers and Mechanics' Association	Ashtabula	Ashtabula	Wm. H. Landon	C. G. Calkins	G. W. Dickinson	300	1857	......
Augusta Central Agricultural Society	Augusta	Carroll	James Hyatt	H. M. Shaw	Ellwood Iddings	81	1866	......
Augusta Farmers' Club	....do.	....do.	J. F. Penar	N. Marshall	L. Marshall	40	1860	......
Berlin Farmers and Mechanics' Club	Berlin	Holmes	George Hott	Edward Hall	John Fugate	13	1861	......
Butler Township Farmers' Institute	Winona	Columbiana	Joseph Crew	S. Williams	Stanton Thomas	46	1866	......
Carmel Agricultural Society	East Fairfield	....do.	J. H. Farr	Benjamin Taylor	Benjamin Taylor	40	1863	......
Chagrin Valley Farmers' Club	Solon	Cuyahoga	G. H. Kent	D. McClintock	D. McClintock	32	1865	......
Chestnut Grove Farmers' Club	Hammondsville	Jefferson	Samuel C. Kerr	J. M. Beard	A. G. Maple	47	1866	......
Claridon Farmers' Club	Claridon	Geauga	....	J. Youd	C. P. Treat	25	1860	23
Cope's Run Agricultural Society	Alliance	Stark	Jonathan Thomas	J. S. Hartley	Henry Huffer	30	1862	12
Damascus Farmers' Club	Damascoville	Columbiana	J. M. Hale	J. W. Stanley	L. M. Kirk	30	1865	......
Deerfield Agricultural Society	Deerfield	Portage	C. S. Tibbals	J. M. Fry	J. L. Tibbals	500	1858	......
Detroit Road Farmers' Club	Cleveland	Cuyahoga	John Spaulding	H. E. Brooks	H. E. Brooks	50	1866	......
Edinburg Agricultural Society	Edinburg	Portage	D. W. Goss	W. Hollister	A. Plumer	127	1856	......
Fairmount Agricultural Club	Mt. Union	Stark	Enos Hilles	B. Brosius	....	20	1867	32
Farmers and Mechanics' Club of Weston Township	Potter	Wood	Dr. H. R. Potter	W. B. Potter	Hugh Watkins	27	1868	34
Glade Run Agricultural Society	Norristown	Carroll	John Long	G. W. King	E. Wilyard	73	1858	......
Granville Farmers' Club	Granville	Licking	S. R. Moore	C. L. Whiting	L. E. Bancroft	27	1856	60
Greene Township Farmers' Lyceum	Cheviot	Hamilton	George Catt	C. Miller	A. Higbee	16	1854	76
Hanover Agricultural and Botanical Society	Loudonville	Ashland	Darius Rust	A. J. Scott	A. J. Scott	12	1861	......
Highland Union Agricultural Association	Garrettsville	Portage	J. F. Whitney	S. M. Luther	S. S. Beecher	363	1860	......
King's Creek Valley Farmers' Club	Kennard	Champaign	Thomas Cowgill	Thomas Cowgill	Thomas Cowgill	10	1862	30
Liberty Farmers' Club	Lewis Centre	Delaware	C. D. Case	I. G. F. Cellar	L. D. Anderson	25	1867	6
Loveland Agricultural and Horticultural Society	Loveland	Clermont	E. J. Emery	S. R. Buckingham	S. B. Smith	30	1864	114
Madison Township Farmers' Club	Newark	Licking	T. S. O'Bannon	Andrew Taylor	David Wilson	18	1846	40
Oberlin Agricultural and Horticultural Society	Oberlin	Lorain	R. Stone	J. M. Worcester	J. M. Worcester	100	1849	118

List of county and township agricultural and horticultural societies, &c.—Continued.

Societies.	Post office address of secretary.	County.	President.	Secretary.	Treasurer.	No. of members.	Date of organization.	No. of volumes in library.
Orwell Agricultural Society	Orwell	Ashtabula	L. Waters	Calvin Reeves	Calvin Reeves	350	1858	......
Pataskala Agricultural Society	Pataskala	Licking	S. C. Williams	J. Atkinson	W. C. Elliott	800	1860	......
Pine Grove Farmers' Club	Hammondsville	Jefferson	John Anderson	W. P. King	T. Anderson	40	1865	......
Prairie College Farmers' Club	Canton	Stark	J. F. Peters	J. K. Neiss	D. E. Gerber	30	1867	......
Rome and Union Farmers' Club	Quaker Bottom	Lawrence	H. N. Gillett	J. P. Eaton	W. D. Hall	12	1845	......
Salt Lick Agricultural Society	Whipstown	Perry	P. H. Shaffer	R. P. Bennett	W. C. Cocke	46	1861	72
Sandy Valley Agricultural Society	Mechanicstown	Carroll	Joseph Yoder	W. P. McClain	W. P. McClain	25	1864	......
Union Agricultural Society	Jamestown	Greene	Robert Brown	J. F. Wickersham	J. F. Wickersham	2,500	1859	......
Union Agricultural Society for Southern Ohio	Blanchester	Clinton	E. J. Emery	J. K. Trickey	J. W. Rice	1,000	1860	......
Washington Township Farmers' Club	Carrollton	Carroll	H. Hanna	C. Marshall	J. Myers	28	1858	......
Horticultural.								
Cincinnati Horticultural Society	Cincinnati	Hamilton	W. P. Anderson	C. H. Wardlow	Robert Clark	200	1843	600
Columbus Horticultural Society	Columbus	Franklin	Henry C. Noble	J. J. Janney	Wm. G. Deshler	......	1851	......
Hocking Valley Horticultural Society	Lancaster	Fairfield	P. B. Ewing	F. J. Boving	G. A. Minthoff	110	1865	300
Moscow Horticultural Society	Moscow	Clermont	W. C. Irwin	W. Johnston	J. I. Selby	38	1867	......
Toledo Horticultural Society	Toledo	Lucas	J. A. Scott	Francis Granger	Francis Granger	......	......	......
OREGON.								
COUNTY SOCIETIES.								
Agricultural.								
Linn County Agricultural Association	Albany	Linn	A. Hackleman	James Elkins	D. Froma	150	1865	......
TOWNSHIP SOCIETIES.								
Agricultural.								
Oswego Farmers' Club	Oswego	Clackamas	Samuel Miller	A. R. Shipley	......	12	1863	......
PENNSYLVANIA.								
COUNTY SOCIETIES.								
Agricultural.								
Adams County Agricultural Society	Gettysburg	Adams	Samuel Herbst	H. J. Stahly	D. Wills	70	1860	20
Berks County Agricultural and Horticultural Society	Reading	Berks	Isaac Eckert	C. H. Schaeffer	Wm. Keely	600	1852	......
Bucks County Agricult'l Society and Mechanics' Institute	Attleborough	Bucks	Wm. Stavely	Pierson Mitchell	C. Hillborn	600	1843	......

Butler County Agricultural and Stock Association	Butler	Butler	J. M. Thompson	Alex. Mitchell	Alex. Mitchell	50	1857	......
Centre County Agricultural Society	Bellfonte	Centre	S. T. Shugert	Wm. Hamilton	John T. Hoover	417	1851	......
Chester County Agricultural Society	West Chester	Chester	J. L. Darlington	Wm. Sharpless	E. H. Townsend	500	1852	......
Clearfield County Agricultural Society	Clearfield	Clearfield	G. R. Barnett	D. F. Etzweiler	A. M. Hills	200	1860	......
Clinton County Agricultural Society	Beech Creek	Clinton	John S. Furst	L. T. Fearon	Wm. Dunn	200	1858	......
Columbia County Agricultural, Horticultural, and Mechanical Association.	Bloomsburg	Columbia	J. P. Conner	L. B. Rupert	E. Mendenhall	850	1855	......
Cumberland County Agricultural Society	Carlisle	Cumberland	Thomas Lee, jr.	W. F. Sadler	Henry Saxton	80	1855	......
Dauphin County Agricultural Society	Harrisburg	Dauphin	A. B. Hamilton	J. H. Zeigler	J. C. Bomberger	100	1852	......
Delaware County Farm-stock Association	Media	Delaware	J. H. Lewis	Henry Greene	F. D. Pierce	100	1860	(*)
Erie County Agricultural Society	Erie	Erie	H. Gingrich	S. J. Butterfield	W. F. Rindernecht	500	1860	600
Fayette County Agricultural Society	Uniontown	Fayette	A. Patterson	W. H. Bailey	A. Hadden	40	1859	......
Greene County Agricultural and Manufacturing Society	Carmichaels	Greene	H. H. Cree	G. W. Daugherty	J. P. Michener	......	1852	......
Huntingdon County Agricultural Society	Huntingdon	Huntingdon	L. Robb	R. McDivitt	George Jackson	500	1855	......
Lancaster County Agricultural Society	Lancaster	Lancaster	F. Brinton	D. G. Eshleman	D. G. Eshleman	......	1858	......
Lehigh County Agricultural Society	Allentown	Lehigh	O. L. Schreiber	J. Stahler	A. G. Reninger	673	1855	......
Luzerne County Agricultural Society	Wyoming	Luzerne	C. Dorrance	Steuben Jenkins	J. Sharps, jr.	100	1857	......
Montgomery County Agricultural Society	Penn's Square	Montgomery	W. B. Roberts	G. F. Roberts	S. Lukens	425	1846	200
Northampton County Agricultural Society	Nazareth	Northampton	P. Kleppinger	C. R. Hoeber	C. Senseman	308	1853	40
Northumberland County Agricultural Society	Milton	Northumberland	W. C. Lawson	J. F. Wolfinger	John Reush	500	1851	......
Perry County Agricultural Society	New Bloomfield	Perry	Joseph Bailey	J. R. Shuier	Henry Rice	......	1851	......
Schuylkill County Agricultural Society	Orwigsburg	Schuylkill	D. Gessley	S. H. Madden	Thomas Hoy	375	1851	......
Sullivan County Agricultural Society	Laporte	Sullivan	G. D. Jackson	Wm. Meylert	W. Molyneaux	100	1852	......
Susquehanna County Agricultural Society	Montrose	Susquehanna	W. H. Jessup	M. M. Mott	C. M. Gere	500	1846	......
Tioga County Agricultural Society	Wellsboro'	Tioga	H. Sherwood	W. A. Nichols	J. L. Robinson	600	1866	......
Union County Agricultural Society	Lewisburg	Union	C. C. Shorkley	J. A. Mertz	N. H. Laird	201	1852	......
Warren County Farmers' Club	Sugar Grove	Warren	H. Harmon	F. R. Miller	W. A. Younie	320	1866	......
Westmoreland County Agricultural Society	Greensburg	Westmoreland	F. J. Cope	C. A. Steck	D. W. Shryock	3,844	1851	......
York County Agricultural Society	York	York	John Evans	W. S. Roland	G. A. Heckert	50	1852	......
Horticultural.								
Chester County Horticultural Society	West Chester	Chester	R. B. Taylor	C. H. Pennypacker	J. Marshall	225	1845	......
Lancaster County Horticultural Society	Lancaster	Lancaster	L. S. Reist	Alex. Harris	P. W. Heistand	67	1866	......
TOWNSHIP SOCIETIES.								
Agricultural.								
Farmers and Mechanics' Institute	Easton	Northampton	Sam'l Yohe	W. G. Field	T. H. Leary	243	1855	......
Farmers and Mechanics' Industrial Association	Chambersburg	Franklin	A. K. McClure	W. S. Everett	G. Kuhn	75	1863	......
Farmers' Club of Andersonburg	Andersonburg	Perry	Samuel Kern	A. B. Anderson	W. Zimmerman	40	......	......
Farmers' Club of Silver Spring	Mechanicsburg	Cumberland	D. E. Kast	H. A. Longsdorf	W. Zeigler	42	1864	......
Farmers' Club of Kennett	Kennett Square	Chester	M. J. Cox	Wm. Rakerstraw	E. Warbass	24	1864	......
Farmers' Social Union	Doe Run	Chester	J. N. Taylor	M. Darlington	M. Darlington	......	1865	......
Greenwood Farmers' Club	Millville	Columbia	J. E. Eves	W. W. Eves	Ellis Eves	......	1865	......
Monongahela Valley Agricultural and Horticultural Soci'y.	Monongahela City	Washington	John Long	C. W. Hazzard	W. J. Alexander	182	1863	80
Moon Township Farmers' Club	Beers	Allegheny	W. H. Guy	H. Breiner	S. J. Ewing	42	1865	100
Octoraro Farmers' Club	Doe Run	Chester	N. Linton	Thomas Wood	W. Coates	15	1856	......
Philadelphia Society for Promoting Agriculture	Philadelphia	Philadelphia	Craig Biddle	A. L. Kennedy	George Blight	150	1785	700
Porter Township Agricultural Club	Alexandria	Huntingdon	D. Hautz	James Allen	J. S. Miller	20	1860	......

* Reports.

List of county and township agricultural and horticultural societies, &c.—Continued.

Societies.	Post office address of secretary.	County.	President.	Secretary.	Treasurer.	No. of members.	Date of organization.	No. of volumes in library.
Robinson Township Agricultural Club	Ewing's Mills	Allegheny	J. Young, jr	J. N. Moore	Alex. Spear	18	1863	......
Union Agricultural Society	Burgettstown	Washington	J. Donaldson	J. P. Wood	S. P. Wilson	1,200	1854	......
Union Farmers' Club of Burgettstown	Burgettstown	Washington	F. Patterson	J. B. Hays	M. R. Allen	50	1863	200
West Grove Farmers and Gardeners' Association	West Grove	Chester	H. Preston	I. Jackson	E. Conard	15	1859	......
Horticultural.								
Mahanoy Valley Horticultural Society	Mahanoy City	Schuylkill	C. M. Hill, jr	L. W. Troutman	G. F. Wiggan	21	1867	......
New Castle Horticultural Society	New Castle	Lawrence	E. M. McConnell	D. Craig	R. W. Clendenin	25	1868	......
Wyoming Horticultural Society	Wyoming	Luzerne	Steuben Jenkins	John Breese	J. P. Atherton	13	......	15
RHODE ISLAND.								
TOWNSHIP SOCIETIES.								
Agricultural.								
Aquidneck Agricultural Society	Newport	Newport	J. Coggeshall	G. A. Brown	G. C. Coggeshall	125	1851	......
Barrington Farmers' Club	Providence	Providence	A. C. Mathewson	J. B. Chapin	Henry Staples	30	1860	......
East Providence Agricultural Society	East Providence	Providence	T. G. Potter	W. W. Ellis	S. O. Case	52	1863	25
SOUTH CAROLINA.								
TOWNSHIP SOCIETY.								
Agricultural.								
Beech Island Farmers' Club	Augusta	Richmond county, Ga.	....	W. H. Atkinson	T. S. Miller	32	1856	......
TENNESSEE.								
COUNTY SOCIETIES.								
Agricultural.								
Maury County Agricultural and Mechanics' Society	Columbia	Maury	L. D. Myers	J. G. Bailey	James Akin	212	1855	......
Warren County Agricultural and Mechanical Association	McMinnville	Warren	J. H. French	D. F. Wallace	Asa Faulkner	104	1858	......

Horticultural.								
Maury County Horticultural Society	Columbia	Maury	M. S. Frierson	H. T. Nicholson	H. T. Nicholson	47	1868	47
TOWNSHIP SOCIETY.								
Agricultural.								
Union Agricultural and Library Society	Stockton	Roane	W. A. Simpson	S. H. Burnett	W. B. Soward	12	1866	40
TEXAS.								
COUNTY SOCIETY.								
Agricultural.								
Austin County Agricultural Society	Cat Spring	Austin	A. Regenbrecht	M. Hartman	Fr. Dross	96	1856	......
Harris County Industrial Association	Houston	Harris	Hon. J. T. Brady	G. A. Forsgard	C. A. Darling	50	1868	(*)
TOWNSHIP SOCIETIES.								
Agricultural.								
Agricultural Society of New Ulm	Industry	Austin	C. Runge	H. Zulauft	D. Findt	53	1867	......
Content Agricultural Society	Content	Colorado	J. Knipscheer	F. Boettcher	J. W. Lee	39	1566	60
Round Top Agricultural Society	Round Top	Fayette	W. E. Jenkins	L. Schlottman	C. L. Schulze	25	1868	......
Southeast Texas Agricultural Society	Milam	Sabine	S. W. Blount	N. A. Davis	L. V. Grier	100	1868	......
UTAH.								
COUNTY SOCIETIES								
Agricultural.								
Beaver County Farmers' Club	Beaver	Beaver	J. R. Murdock	Daniel Tyler	James Farrar	120	1866	......
Davis County, Branch of Deseret, Agricultural and Manufacturing Society.	Farmington	Davis	H. C. Haight	A. Stayner	E. T. Clark	308	1858	......
Utah County Agricultural and Home Manufacturing So'y.	Provo City	Utah	A. H. Scott	Daniel Graves	J. Buxton	356	1858	......
Washington County Gardeners' Club and Library Asso'n.	Washington	Washington	J. Richey	W. H. Crawford	W. H. Crawford	35	1864	28
Weber County, Branch of Deseret, Agricultural and Manufacturing Society.	Ogden City	Weber	C. W. West	W. Thompson	Joseph Parry	155	1856	......
Horticultural.								
Kane County Horticultural Society	Rockville	Kane	A. L. Siler	S. K. Gifford	O. Daniells	......	1866	10
TOWNSHIP SOCIETIES.								
Agricultural.								
American Fork Agricultural Society	American Fork	Utah	Richard Steel	Wm. Greenwood	L. E. Harrington	44	1858	300
American Fork Gardeners' Club and Mechanics' Institute.	American Fork	Utah	T. Wrigley	John Duncan	T. Eldredge	33	1864	251
Brigham City Agricultural and Manufacturing Society	Brigham City	Box Elder	Alvin Nichols	James Bywater	W. L. Watkins	156	1861	......
Cedar City Agricultural and Manufacturing Society	Cedar City	Iron	John Chatterley	D. S. Macfarlane	J. M. Higbee	100	1862	20
Deseret Agricultural and Manufacturing Society	Salt Lake City	Salt Lake	W. Woodruff	R. L. Campbell	E. F. Sheets	104	1856	(†)

* None. † Reports.

List of county and township agricultural and horticultural societies, &c.—Continued.

Societies.	Post office address of secretary.	County.	President.	Secretary.	Treasurer.	No. of members.	Date of organization.	No. of volumes in library.
Domestic Gardeners' Club	Salt Lake City	Salt Lake	G. B. Wallace	J. McKnight	J. McKnight	30	1859	(*)
Ephraim Branch of San Pete Agricultural and Horticultural Society.	Ephraim	San Pete	Edward Jones	H. F. Peterson	Niles Benson	93	1859	124
Fairview Agricultural and Horticultural Society	Fairview	San Pete	H. W. Sanderson	Wm. Christensen	L. Wilson	54	1863	......
Fountain Green Agricultural and Horticultural Society	Fountain Green	San Pete	N. S. Guyman	R. Llewellyn	J. Woodward	50	1868	......
Gardnersville Gardeners' Club	Gardnersville	Utah	Wm. Stewart	J. Gardener	R. Kinnison	50	1863	126
Gardeners' Association	Toquersville	Washington	Chas. Stapley, jr.	John Steele	Chas. Stapley, sr.	13	1865	12
Gardeners' and Pomological Club	Santaquin	Utah	D. M. Holladay	Henry Green	L. A. Jensen	63	1863	......
Gunnison Farmers, Gardeners, and Foresters' Club	Gunnison	San Pete	A. Shaw	A. Madsen	J. Reidhead	67	1867	344
Meadow Creek Farmers' Club	Meadow Creek	Millard	Wm. Stewart	W. H. Stott	James Fisher	35	1868	......
Minersville Agricultural Society	Minersville	Beaver	E. Blackburn	J. H. Rollins	T. Lewis	53	1868	71
Moroni Farmers and Gardeners' Club	Moroni	San Pete	J. Shepherd	C. Longson	J. Jensen	25	1864	12
Nephi Branch of Deseret Agricultural and Manufacturing Society.	Nephi	Juab	J. Midgely	Thomas Ord	T. S. Hoyt	87	1862	......
Parowan Gardeners' Club	Parowan	Iron	D. Page	T. Durham	H. D. Bailess	36	1865	......
Payson Agricultural and Gardeners' Club	Payson	Utah	J. Loveless	J. T. Hardy	G. Simons	35	1861	......
Provo Gardeners and Mechanics' Institute	Provo	Utah	J. Buxton	A. F. McDonald	H. A. Cleaver	28	1863	100
Rockville Farmers' Club	Rockville	Kane	A. L. Silex	J. C. Hall	J. R. Gifford	17	1868	......
Salt Lake City Eastern Gardeners' Club	Salt Lake City	Salt Lake	J. Proctor	Wm. Fuller	A. Spiers	81	1866	(*)
San Pete, Branch of Deseret, Agricultural Society	Mount Pleasant	San Pete	E. Jones	D. Candland	N. Benson	204	1858	260
San Pete Gardeners' Club	Manti City	San Pete	W. K. Barton	Wm. T. Reid	M. D. Hambleton	40	1867	......
Shoensburg Farmers' Club	Rockville	Kane	J. G. Allred	S. T. Kenner	O. De Mill	36	1868	......
Smithfield Farmers' Club	Smithfield	Cache	E. M. Greene	J. McCarthy	J. S. Cantwell	36	1867	......
Southern Utah Agricultural and Manufacturing Society	St. George	Washington	Jacob Gates	J. G. Bleak	A. M. Cannon	315	1864	......
Spanish Fork Gardeners' Club	Spanish Fork	Utah	C. H. Hales	Chas. Monk	Wm. Robertson	38	1864	15
Springtown Gardeners' Club	Springtown	San Pete	J. Schofield	John Acton	Geo. Brough	42	1868	......
Wasatch Base Gardeners' Club	Ogden City	Weber	Aaron Farr	J. A. Jost	S. E. Jost	65	1864	......
Wasatch Manufacturing and Agricultural Society	Heber City	Wasatch	R. W. Glenn	Wm. Chatwin	Wm. Moulton	60	1868	......
Horticultural.								
Harrisburg Horticultural Society	Harrisburg	Washington	E. K. Fuller	E. H. Harrington	O. B. Adams	22	1866	35
St. George Horticultural and Pomological Association	St. George	Washington	J. E. Johnson	W. H. Branch	D. Rogers	30	1865	40
VERMONT.								
COUNTY SOCIETIES.								
Agricultural.								
Addison County Agricultural Society	Weybridge	Addison	H. O. Gifford	A. S. Childs	E. Vallette	525	1844	......

Bennington County Agricultural Society	Bennington	Bennington	T. W. Park	W. H. Cook	N. Bottum		1853	
Caledonia County Agricultural Society	Lyndon Centre	Caledonia	H. M. Hall	Isaac W. Sanborn	A. M. Cooke	600	1844	
Lamoille County Agricultural Society	Elmore	Lamoille	G. W. Hendie	J. W. Bryant	H. S. Kelsey	800	1865	
Orleans County Agricultural Society	Irasburgh	Orleans	Mark Nutter	Z. E. Jameson	I. N. Cushman	300	1867	
Windham County Agricultural Society	Fayetteville	Windham	L. F. Ward	W. A. Stedman	W. A. Stedman	600	1843	
Windsor County Agricultural Society	Woodstock	Windsor	Samuel Taylor	L. Kent	L. Richmond	665	1846	
TOWNSHIP SOCIETIES.								
Agricultural.								
Brandon Farmers' Club	Brandon	Rutland	H. H. Merritt	R. V. Marsh	J. W. Cheeney	50	1859	200
Caledonia Wool-growers and Sheep-breeders' Association	Lyndon Centre	Caledonia	H. M. Hall	Isaac W. Sanborn	J. Lawrence	103	1867	
Champlain Valley Agricultural Society	Vergennes	Addison	G. W. Grandey	J. H. Lucia	E. H. Landon		1867	
Lower Waterford Farmers' Club	Lower Waterford	Caledonia	F. R. Carpenter	A. B. Goss		20	1862	(*)
Orwell Farmers' Club	Orwell	Addison	C. E. Abell	O. S. Branch	H. A. Griswold	50	1854	
Randolph Farmers' Club	Randolph	Orange	B. Adams	J. B. Mead	J. B. Mead	85	1862	
Springfield Farmers' Club	Springfield	Windsor	C. H. Hubbard	H. M. Arms	D. O. Sill	45	1862	
Springfield Thorough-bred Stock Association	Springfield	Windsor	H. M. Arms	J. R. Walker	J. E. White	20	1867	
West Marshfield Agricultural Club	Marshfield	Washington	C. W. H. Dwinell	L. W. Pitkin	E. B. Dwinell	52	1867	
Westminster Harvest Club	Westminster	Windham		L. F. Ward	L. F. Ward	20	1867	
Wilmington Agricultural Society	Wilmington	Windham	S. B. Barnard	C. C. Haskell	J. H. Russell	175	1852	
VIRGINIA.								
TOWNSHIP SOCIETIES.								
Agricultural.								
Herndon and Guilford Farmers' Club	Herndon	Fairfax	A. St. John	Wm. Urich	Wm. Urich	24	1868	
Woodlawn Agricultural Society	Accotink	Fairfax	C. Gillingham	F. A. Augustine	R. F. Roberts	31	1866	
Horticultural.								
Norfolk Horticultural and Pomological Society	Norfolk	Norfolk	G. F. B. Leighton	S. Patterson	S. Patterson		1868	
WEST VIRGINIA.								
TOWNSHIP SOCIETIES.								
Agricultural.								
Central Agricultural and Mechanics' Society	Clarksburg	Harrison	R. T. Lowndes	Lee Haymond	L. Haymond	318	1867	
Huttonsville Agricultural and Pomological Society	Huttonsville	Randolph	J. I. Hill	Alfred Hutton	J. L. Suter	35	1846	
Northwest Virginia Agricultural Society	Wheeling	Ohio	T. Hornbrook	John Bishop	John Bishop	200	1866	
WISCONSIN.								
COUNTY SOCIETIES.								
Agricultural.								
Adams County Agricultural Society	Plainville	Adams	Anson Reed	S. W. Tyler	W. H. Crosby	75	1859	
Brown County Agricultural Society	Green Bay	Brown	J. G. Lawton	A. C. Robinson	D. Butler	90	1860	
Columbia County Agricultural Society	Portage	Columbia	H. S. Haskell	C. C. Britt	J. B. Dwinnell	355	1851	

* Reports.

List of county and township agricultural and horticultural societies, &c.—Continued.

Societies.	Post office address of secretary.	County.	President.	Secretary.	Treasurer.	No. of members.	Date of organization.	No. of volumes in library.
Dodge County Agricultural Society	Juneau	Dodge	H. C. Crandall	Eli Hawks	Charles End	35		
Fond du Lac County Agricultural and Mechanical Society	Fond du Lac	Fond du Lac	S. E. Hammond	James Orvis	A. B. Taylor	270	1852	
Grant County Agricultural Society	Lancaster	Grant	Joel Potter	T. A. Burr	H. Reading	24	1855	
Green County Agricultural Society and Mechanics' Ins'te	Monroe	Green	F. F. West	W. W. Wright	Wm. Brown	481	1857	
Green Lake County Agricultural Society	Dartford	Green Lake	I. W. Smith	M. H. Powers	M. H. Powers	280	1854	
Iowa County Agricultural Society	Dodgeville	Iowa	John Ellwood	Orville Strong	S. Hoskins	360	1856	
Jackson County Agricultural Society	Black River Falls	Jackson	W. T. Price	F. Simpson	J. V. Wells	126	1859	
Jefferson County Agricultural Society	Jefferson	Jefferson	D. Folsom	G. J. Clapp	Wm. Eustis	350	1853	
Kenosha County Agricultural Society	Bristol	Kenosha	J. D. Fowler	H. S. Thorp	L. W. Thayer	200	1856	
La Crosse County Agricultural Society	West Salem	La Crosse	W. L. Dudley	A. J. Philips	V. M. Adams	432	1858	
La Fayette County Agricultural Society	Darlington	La Fayette	F. Buckmaster	W. W. Birkett	J. H. Martin	637	1857	
Monroe County Agricultural Society	Sparta	Monroe	A. H. Isham	H. E. Kelley	T. B. Tyler	220	1859	
Outagamie County Agricultural Society	Appleton	Outagamie	Louis Perrot	A. H. Lanphear	E. C. Goff	105	1860	
Outagamie County Fruit-growers' Association	Appleton	Outagamie	R. Pearson	J. S. Bucks	D. Huntley	25	1863	
Ozaukee County Agricultural Society	Cedarburg	Ozaukee	A. M. Alling	Wm. Vogenitz	B. O. L. Kasson	70	1859	
Pierce County Agricultural Society	Prescott	Pierce	J. M. Bailey	J. M. McKee	M. W. Barb	184	1859	
Polk County Agricultural Society	St. Croix Falls	Polk	J. S. Godfrey	H. D. Barron	W. Amery	100	1866	
Richland County Agricultural Society	Richland Centre	Richland	J. H. Carswell	D. L. Downs	L. D. Gage	47	1867	
Rock County Agricultural Society	Janesville	Rock	Lewis Clark	R. J. Richardson	Alfred Hoskins			
Saint Croix Agricultural Society	Hudson	St. Croix	T. D. Hall	C. L. Hall	W. M. Otis	136	1858	
Sauk County Agricultural Society	Baraboo	Sauk	H. H. Potter	J. J. Gattiker	H. Cowles	103	1855	
Sheboygan County Agricultural Society	Sheboygan Falls	Sheboygan	Hiram Smith	John E. Thomas	T. Strong	242	1851	
Sheboygan County German Agricultural Society	Sheboygan	Sheboygan	C. A. Festerling	F. Stoesser	A. Geisler	42	1859	
Vernon County Agricultural Society	Viroqua	Vernon	Ira P. Tracy	R. C. Bierce	S. C. Lincoln	193	1856	
Walworth County Agricultural Society	Elk Horn	Walworth	Charles Wales	Hollis Latham	L. G. Rockwell	332	1856	
Waukesha County Agricultural Society	Waukesha	Waukesha	Edward Porter	Elihu Enos	J. L. Smith	150	1855	
Waupacca County Agricultural Society	Waupacca	Waupacca	F. Beardmore	Leslie J. Perry	W. Scott	100	1858	
TOWNSHIP SOCIETIES.								
Agricultural.								
Farmers' Club of Ripon	Ripon	Fond du Lac	H. H. Dixon	A. T. Glaze	H. M. Chapin	85	1865	
Farmers' Union Agricultural Association	Appleton	Outagamie	S. Wolcott	Edwin Nye	G. Knowles	12	1858	60
German Agricultural Society	New Holstein	Calumet	F. Hachez, sr	F. Hachez	Henry Peters	53	1855	14
Kinnick Kinnick Farmers' Club	River Falls	Pierce	H. L. Wadsworth	J. A. Mapes	J. A. Mapes	16	1862	
Lake Superior Agricultural Society	Superior	Douglas	J. W. Gates	E. C. Becker	L. F. Wheelock	60	1859	100
Southwestern Wisconsin Farmers' Club	Apple River	Jo. Daviess, Ill	J. Anderson	J. H. Wooding	R. Fillmore	52	1866	
Walsh Agricultural Society	Kingston	Green Lake	Evan R. Evans	Wm. E. Williams	Daniel T. Price	8	1868	

Wisconsin Agricultural and Mechanical Society	Milwaukee	Milwaukee	E. H. Brodhead	H. C. Brodley	H. Brightman	100	1860	......
Wolf River Agricultural Society	Frémont	Waupacca	G. Spindler	Henry Spindler	C. Burgener	15	1863	25
Horticultural.								
German Horticultural Society	Madison	Dane	F. A. Pfaff	Wm. Helm	C. Gewecke	38	1865	25
Glenbeulah Horticultural Society	Glenbeulah	Sheboygan	J. B. Corson	Edwin Slade	J. T. Dillingham	10	1865	......
Jamesville Horticultural Society	Janesville	Rock	J. B. Whiting	F. S. Lawrence	S. W. Smith	40	1866	......
Kenosha Horticultural Society	Kenosha	Kenosha	H. B. Hinsdale	H. T. O'Farrell	S. Y. Brande	53	1868	......
Madison Horticultural Society	Madison	Dane	W. T. Leitch	J. Hobbins	G. A. Mason	30	1858	......

AGRICULTURAL AND HORTICULTURAL PERIODICALS.

The following list embraces the names, locations, &c., of the magazines and newspapers devoted to the advancement of agriculture, horticulture, and kindred interests within the United States:

MAINE.

The Maine Farmer, Augusta, Maine.—Issued weekly, and printed on a large folio sheet, 28 columns; $2 per annum in advance, $2 50 if not paid within three months; N. T. True and S. L. Boardman, editors. Established in 1833.

NEW HAMPSHIRE.

The Mirror and Farmer, Manchester, N. H.—Weekly; quarto; $1 50 per annum; John B. Clarke, editor, publisher, and proprietor. Established in 1850 as the "Granite State Farmer," by James O. Adams; "The Farmer" was purchased by Mr. Clarke in 1862, and united with the "Weekly Mirror," under the present title.

MASSACHUSETTS.

The New England Farmer, Boston, Mass.—Weekly; large folio of 32 columns; $3 per annum, or $2 50 in advance; R. P. Eaton & Company, publishers and proprietors; Simon Brown, agricultural editor; S. Fletcher, assistant editor; R. P. Eaton, general editor. Established in 1822 by T. W. Shepard. It was soon afterwards purchased by John B. Russell, who published it eight years. It was edited by T. G. Fessenden till his death in 1836. It was afterwards published and conducted by Joseph Breck till 1840, when it was united with the Horticulturist. From its first establishment it had able contributors, among whom were the late Colonel T. Pickering, John Lowell, Governor Lincoln, Judge Buel and General Dearborn.

The New England Farmer, Boston, Mass.—Monthly; octavo, 48 pages; $1 50 per annum; R. P. Eaton & Company, publishers and proprietors; Simon Brown and S. Fletcher, editors. Established January 1, 1867, by the present publishers.

The Boston Cultivator, Boston, Mass.—Weekly; quarto; $3 per annum, or $2 50 in advance; Otis Brewer, editor, publisher, and proprietor, by whom it was established January 12, 1839.

The Massachusetts Ploughman, Boston, Mass.—Weekly; large folio; $2 50 per annum; George Noyes, publisher and proprietor. Established October 1, 1841, by Joseph Buckminster, by whom it was continued until October 1, 1862; Hugh W. Greene published it from that date to May, 1863, when it passed into the hands of the present proprietor.

The Magazine of Horticulture, Boston, Mass.—Monthly; octavo, 32 pages; $2 per annum; Hovey & Company, publishers; C. M. Hovey, editor and proprietor. Established January 1, 1835, by the present proprietor.

The American Journal of Horticulture and Florists' Companion, Boston, Mass.—Monthly; octavo, 64 pages; $3 per annum; J. E. Tilton & Company, publishers. Established January 1, 1867, by the present proprietors.

The New England Homestead, Springfield and Northampton, Mass.—Weekly; quarto; \$2 50 per annum; Henry M. Burt and A. Percy Peck, publishers and proprietors. Established May 16, 1868.

The New England Homestead, Springfield and Northampton, Mass.—Monthly; octavo, 16 pages; 75 cents per annum; Henry M. Burt and A. Percy Peck, publishers and proprietors. Established April, 1867.

NEW YORK.

The American Agriculturist, New York city.—Monthly; double octavo, 40 pages; printed in English and German; \$1 50 per annum; Orange Judd & Company, publishers and proprietors; Orange Judd, general supervising editor; Dr. George Thurber, chief managing and horticultural editor; Colonel Mason E. Weld, agricultural editor; Rev. William Clift, ("Tim Bunker, esq.,") general assistant; William A. Fitch, editor of youths' and advertising departments; Frederick Münch, German editor; Dr. Carlos Riedel, assistant editor. Mr. Clift has been connected with the paper about 16 years; Messrs. Fitch and Riedel about 10 years; Dr. Thurber 7 years; and Colonel Weld 6 years. Established in 1842 by A. B. and R. L. Allen, by whom it was mainly owned and edited until June, 1853, when Orange Judd assumed editorial charge, becoming sole proprietor in 1855. In 1865 Lucius A. Chase, and in 1867 Samuel Burnham, jr., purchased business interests, forming the present firm of Orange Judd & Company. Circulation about 150,000 copies.

Moore's Rural New Yorker, New York city, and Rochester, N. Y.—Weekly; large double quarto; \$3 per annum; D. D. T. Moore, editor, with an able corps of associate and corresponding editors and special contributors, including Hon. Henry S. Randall, LL. D., editor of the department of sheep husbandry, and Dr. Daniel Lee, southern corresponding editor. Established at Rochester in 1850 by its present conductor and proprietor. The paper was considerably enlarged in January, 1868.

The Cultivator and Country Gentleman, Albany, N. Y.—Weekly; quarto, 16 pages; \$2 50 per annum; Luther Tucker & Son, publishers and proprietors; Luther Tucker, Luther H. Tucker, and John J. Thomas, editors, supported by an able corps of assistants. This journal dates back to the establishment, by Luther Tucker, of the Genesee Farmer at Rochester, New York, in 1830, which paper, in 1839, was combined with the Cultivator, originally established at Albany in 1834, under the auspices of several gentlemen, of whom the leading spirit, and for some time subsequently the sole editor and proprietor, was Jesse Buel. Upon his death in 1839 Mr. Tucker assumed the helm, and the paper was entitled the "Cultivator, a consolidation of Buel's Cultivator and the Genesee Farmer," though the latter part of the name was dropped after a few years. The paper was issued monthly, and in 1844 was changed from quarto to octavo form. In 1853 the Country Gentleman was commenced as a weekly, the Cultivator being continued in cheaper form, and made up of selections from the Country Gentleman until 1866 when the subscription lists were united, the monthly issue discontinued, and the title of the weekly changed to the Cultivator and Country Gentleman.

The Rural American, published at New York city; editorial and general business office, New Brunswick, N. J.—Semi-monthly, issued the 1st and 15th; double octavo, 16 pages; \$1 50 per annum; T. B. Miner, editor and proprietor. Established at Utica, N. Y., in 1857, by the present proprietor, and removed to New York city in 1868. Circulation about 20,000 copies.

The Working Farmer, New York city.—Monthly; double octavo, 24 pages; \$1 50 per annum; William L. Allison, editor and proprietor. Established in 1848 by Professor James J. Mapes, who sold it to the present proprietor in October, 1862.

The American Farmer, Rochester, N. Y.—Monthly; octavo, 32 pages; $1 per annum; John R. Garretsee, editor, publisher, and proprietor. Established January 1, 1866, by John Turner, who, in August, 1868, sold out to the present proprietor.

The Horticulturist and Journal of Rural Art and Rural Taste, New York city.—Monthly; octavo, 32 pages; $2 50 per annum; F. W. Woodward, editor and publisher. Established in 1846.

Whitlock's Horticultural Recorder, New York city.—Monthly; octavo, 40 pages, exclusive of advertisements; L. L. Whitlock, proprietor; Andrew S. Fuller, editor. Established January 1, 1867, by the present proprietor

PENNSYLVANIA

The Germantown Telegraph, Germantown, (Philadelphia,) Pa.—Weekly; large folio, 36 columns; $2 per annum in advance, $3 if not so paid; Philip R. Freas, editor and proprietor. Established in 1830.

The Gardener's Monthly, Philadelphia, Pa.—Monthly; octavo, 32 pages; $2 per annum; W. G. P. Brinckloe, publisher; Thomas Meehan, editor. Established January 1, 1859, by D. Rodney King as publisher and Thomas Meehan, editor.

The Practical Farmer and Rural Advertiser, Philadelphia, Pa.—Monthly; double octavo, 16 pages; $1 per annum; Paschall Morris, editor and proprietor. Established September 1, 1863, as the "Rural Advertiser," by the present proprietor, at 50 cents per annum. In January, 1867, the paper was enlarged, and the present title adopted.

The American Stock Journal, Parkesburgh, Pa.—Monthly; octavo, 32 pages; $1 per annum; N. P. Boyer & Company, editors and publishers; A. Marshall, associate editor. Established January, 1866. This journal is devoted to farming and stock-breeding.

The National Agriculturist and Pennsylvania Farm Journal, Pittsburg, Pa.—Monthly; octavo, 16 pages; $1 per annum; J. M. & G. D. Kuester, publishers.

MARYLAND.

The American Farmer, Baltimore, Md.—Monthly; octavo, 32 pages, exclusive of advertisements; $2 per annum; Worthington & Lewis, publishers. Established in 1819, and claimed to be the oldest agricultural periodical in the United States.

The Maryland Farmer, Baltimore, Md.—Monthly; octavo, 32 pages, exclusive of advertisements; $1 50 per annum; S. Sands Mills & Company, publishers and proprietors. Established in 1864.

The Rural Gentleman, Baltimore, Md.—Monthly; octavo, 20 pages, exclusive of advertisements; $1 per annum; J. B. Robinson & Company, proprietors. Established July, 1866, by the present proprietors.

WASHINGTON, D. C.

The American Bee Journal, Washington, D. C.—Monthly; octavo, 24 pages; $1 per annum; Samuel Wagner, editor and proprietor, by whom it was established in July, 1865.

VIRGINIA.

The Southern Planter and Farmer, Richmond, Va.—Monthly; octavo, 64 pages; $2 per annum; Charles B. Williams, editor and proprietor. Established as the Southern Planter, January 1, 1841, by Charles T. Botts. In January,

1847, the paper passed into the hands of Peter D. Bernard, and was enlarged to 32 pages, under the editorial charge of John M. Daniel. July 1, 1849, Mr. D. was succeeded by Richard B. Gooch as editor, who continued in charge until his death, in 1851, when Frank G. Ruffin became the editor, and in 1855 the proprietor. During Mr. R.'s ownership the Southern Planter was doubled in size, and the price increased from $1 to $2 per annum, and N. August admitted as a partner In July, 1858, Dr. James E. Williams succeeded Mr. Ruffin in the firm, and took editorial charge until July, 1861, when the publication was suspended through the effects of the war. February 1, 1867, the publication was resumed by Charles B. Williams, as editor and proprietor, and at the end of the year it was united with "The Farmer," and is now issued as the "Southern Planter and Farmer."

The Farmers' Gazette and Industrial Index, Richmond, Va.—Monthly; octavo, 32 pages; $1 50 per annum; S. Bassett French, editor and proprietor. Established July 1, 1868.

GEORGIA.

The Southern Cultivator, Athens, Ga.—Monthly; octavo, 32 pages exclusive of advertisements; $2 per annum; Wm. & W. S. Jones, editors and proprietors. Established in 1843, at Augusta, Georgia, by J. W. and W. S. Jones. In 1860 it was purchased by D. Redmond, and in 1864 by Wm. N. White, of Athens, Georgia, whether it was removed. At the close of 1867 it passed into the hands of the present proprietors. From 1843 to 1844 the Cultivator was edited by J. W. Jones; 1844 to 1847 by James Camak; 1847 to 1852 by Dr. D. Lee; 1852 to 1859 by Lee and Redmond; 1859 to 1864 by Redmond and Howard; 1864 to 1867 by Redmond and White; 1867 to 1868 by Remond and Camak; and from January, 1868, by the present editors.

The Rural Southerner, Atlanta, Ga.—Monthly; octavo, 24 pages; $1 per annum; Miller and Bailey, publishers; Samuel A. Echols, editor. Established March 1, 1868.

MISSISSIPPI.

The Model Farmer, Corinth, Miss.—Semi-monthly; octavo, 16 pages; issued the 1st and 15th; $2 per annum; Key & Barr, publishers and proprietors; Thomas J. Key, editor. Established March, 1868.

LOUISIANA.

The Southern Ruralist, Tangipahoa, La.—Monthly; octavo, 32 pages; $1 50 per annum; H. A. Swasey, M. D., editor and proprietor; E. F. Russell, associate editor. Established in 1867.

TENNESSEE.

The Southern Farmer, Memphis, Tenn.—Monthly; quarto, 24 pages; $2 per annum; The Southwestern Publishing Company, publishers; Dr. M. W. Phillips, chief editor, assisted by Professor E. W. Hilgard, P. J. Berckmans, Geo. W. Gift, Geo. Husmann, C. C. Langdon, J. Van Buren, and D. L. Adair. Established January, 1867, by Dr. M. W. Phillips.

The Dixie Farmer, Columbia, Tenn.—Weekly; double octavo, 16 pages; $3 per annum; Nicholson & Williams, publishers and proprietors; Hunter Nicholson, editor. Established April 15, 1868, by Hunter Nicholson, editor, and W. S. Bliss & Company, publishers. Subsequently R. W. Williams purchased an interest, making the firm as above.

KENTUCKY.

The Industrial and Commercial Gazette, Louisville, Ky.—Weekly; quarto;

$3 per annum; J. H. Turner, publisher and proprietor; O. S. Leavitt, editor. Established November 25, 1865, by the present proprietor.

The Farmers' Home Journal, Lexington, Ky.—Weekly; quarto; $3 per annum; James J. Miller, editor and proprietor. Established in 1867.

OHIO.

The Ohio Farmer, Cleveland, Ohio.—Weekly; quarto, 16 pages; $2 per annum; S. D. Harris, editor and proprietor; George E. Blakelee and Mrs. Helen L. Bostwick, associate editors. Established in January, 1852, by Thomas Brown. In 1862 it passed into the hands of Mr. Harris. In June, 1867, the "Ohio Cultivator" was merged into the "Farmer," under the present management.

The Farmers' Chronicle, Columbus, Ohio.—Weekly; quarto, 16 pages; $2 per annum; J. W. Dwyer & Wm. H. Busbey, editors and proprietors; G. S. Innis, agricultural editor. Established January, 1868.

The Sorgo Journal and Farm Machinist, Cincinnati, Ohio.—Monthly; octavo, 24 pages; 50 cents per annum; Blymyer, Norton & Company, publishers and proprietors; Wm. Clough, editor. Established January, 1863, by Wm. H. Clark, with Mr. Clough as editor. In 1864 it was purchased by the present proprietors. This journal is especially devoted to the culture of sorghum.

The American Farmers' Magazine, Cincinnati, Ohio.—Monthly; octavo, 32 pages; $1 50 per annum. Issued the 20th of each month. Charles S. Burnett, publisher. Established June, 1868.

The Ruralist, Cincinnati, Ohio.—Monthly; $1 per annum; J. S. Sheppard, publisher. Established in March, 1868.

INDIANA.

The Northwestern Farmer, Indianapolis, Ind.—Monthly; quarto, 24 pages; $1 50 per annum; T. A. Bland and T. B. Taylor, editors and proprietors. Established December, 1865, by T. A. Bland.

ILLINOIS.

The Prairie Farmer, Chicago, Ill.—Weekly; quarto, 16 pages; $2 per annum; Prairie Farmer Company, publishers and proprietors; Henry D. Emery, W. W. Corbett, and H. T. Thomas, editors. Established January, 1841, by John S. Wright, and issued monthly up to 1856, when it was changed to a weekly. In 1858 the paper was purchased by Emery & Company, and merged into "Emery's Journal of Agriculture," under the combined names. In 1859 the "Journal of Agriculture" was dropped from the title, and the paper changed to the present form.

The Western Rural, Chicago, Ill., and Detroit, Mich.—Weekly; quarto; $2 50 per annum. This journal is published simultaneously at Chicago, Illinois, and Detroit, Michigan. H. N. F. Lewis, editor and proprietor; G. E. Morrow, Chicago, and Edward Mason, Detroit, associate editors. Established September 1, 1864, at Detroit, the Michigan Farmer being merged therein.

The Rural Messenger, Chicago, Ill.—Monthly; quarto, 16 pages; $1 per annum; Josiah Bonham, editor and proprietor. Established January 1, 1868.

The Rural West, Quincy, Ill.—Monthly; $1 per annum; T. M. Rogers, publisher and proprietor. Established in 1868.

WISCONSIN.

The Wisconsin Farmer, Madison, Wis.—Weekly; quarto; $2 per annum. W. B. Davis, publisher and proprietor. Established in 1849, by Mark Miller as a monthly. It was subsequently owned by Powers & Spinner, and J. W. Hoyt, and in 1860 was purchased by the present proprietor, who, in 1867, changed it to a weekly journal.

The Northern Farmer, Fond du Lac, Wis.—Monthly; double octavo, 16 pages; $1 per annum; Fred. D. Carson, editor and proprietor. Established January, 1863, by E. H. Jones & Brother, at 50 cents per annum. In January, 1867, the size was increased and the price advanced, and in December the paper was purchased by the present proprietors.

MINNESOTA.

The Farmers' Union, Minneapolis, Minn.—Monthly; 50 cents per annum; W. A. Nimocks, publisher; John H. Stevens, editor. Established August 1, 1867.

IOWA.

The Iowa Homestead and Horticulturist, Des Moines, Iowa.—Weekly; quarto; $2 50 per annum; Mark Miller, editor and proprietor. Established in 1856.

MISSOURI.

Colman's Rural World and Valley Farmer, St. Louis, Mo.—Weekly; double octavo, 16 pages; $2 per annum; Norman J. Colman, editor and proprietor; Wm. Muir and C. W. Murtfeldt, associate editors. Established in 1849, as a monthly; subsequently published semi-monthly, and now issued weekly.

The Journal of Agriculture, St. Louis, Mo.—Weekly; double octavo, 16 pages; $2 per annum; L. D. Morse & Company, publishers and proprietors; L. D. Morse, editor. Established in 1866, by Plant & Brother, as the "Farmers' Advertiser;" issued monthly. At the beginning of 1867 Mr. Morse assumed editorial charge, and the paper was enlarged and published semi-monthly. In November, 1867, it passed into the hands of the present proprietors, who changed the title to the "Journal of Agriculture," and in January, 1868, made it a weekly publication.

The American Entomologist, St. Louis, Mo.—Monthly; octavo; $1 per annum; R. P. Studley & Company, publishers; Benjamin D. Walsh and C. V. Riley, editors. Established September 1, 1868.

KANSAS.

The Kansas Farmer, Leavenworth, Kansas.—Monthly; double octavo, 16 pages; $1 per annum; G. T. Anthony and G. A. Crawford, editors.

CALIFORNIA.

The California Farmer, San Francisco, Cal.—Weekly; large quarto; $5 per annum; Warren & Company, publishers; Colonel Warren, editor. Established in 1853, by the present proprietors.

COTTON UNDER HIGH CULTURE.

By George W. Gift, Memphis, Tenn.

If the production of cotton is to be continued, it must be under some system which will secure an adequate return for the capital invested in the enterprise, as well as food, clothes, and wages for the laborers, which is not possible under the present routine.

Cotton is now cultivated under a very slovenly system, if it can be called a

system. No manures are used, the first ploughing scarcely exceeds two inches in depth, and the after cultivation is often delayed at the critical time. until the crop is materially injured by being crowded by grass. Under this system, I think a yield of three bales to the hand a large estimate, with not enough provisions—plain bread and meat—to support employés and feed teams. Now, when these three bales have netted but $200, it will require but little skill in figures to determine that there is no money in such a business.

Cotton is a great staple, however; all the civilized world demands it. Its sale is ready and certain, and at prices which would be very remunerative, if it were cultivated in a rational manner; and it is the purpose of this paper to contribute, in some degree, to such improvement. In what may be said I will advance no untried theory, but be guided solely by the lights of experience.

Dr. N. B. Cloud, of Alabama, some years since, reported a yield of 5,975 pounds of seed cotton from one acre of fine upland, manured with 5,000 bushels of barnyard compost. From my knowledge of such lands, I should judge that the clear gain from manuring was fully 5,500 pounds of seed cotton, equal to 1,700 pounds of lint, (counting 3⅓ pounds of seed cotton for one of lint,) worth now about $425, net! Total yield of the acre, 1,810 pounds lint, worth $452. On good, deep, upland loam, a much smaller quantity of manure, coupled with thorough culture, would probably have brought about the same result.

Mr. David Dickson of Hancock county, Georgia, says, in the Southern Cultivator:

My last crop of cotton, under the old system, was grown on 950 acres. I made 810 bales. The greatest amount I ever made per acre was on four acres of upland. I used 400 pounds guano, with the usual quantity of salt and plaster for turnips, and fed them off on the lot. The following spring I added 100 pounds guano, 100 pounds dissolved bones, 100 pounds salt, and 50 pounds plaster per acre, and put in cotton. The crop was 4,200 pounds seed cotton per acre.

From the four acres the crop was 16,800 pounds seed cotton, equal to 5,150 pounds lint; worth now $1,287, net! or nearly $322 per acre—a sum quite equal to the profits of some market gardens in the neighborhood of cities, where the lands are valued at $1,000 per acre. The same gentleman says, in a later communication:

The land (a lot of 16 acres) is good, pine land, and has been under the plough nearly 70 years, and as many as 55 years in cotton. About 12 years ago it was sown in oats, with 200 pounds guano and bones, mixed with salt and plaster, and made 30 or 35 bushels per acre; all fed off by turning stock in the field. Four years ago, I left it uncultivated until the middle of July, there was then a heavy growth of weeds on it, just grown. I turned them in, and dropped peas in every third furrow. The result was a heavy crop of vines, and at least 15 bushels of peas per acre. These were fed off by beef cattle. * * * It was planted in cotton in 1866. * * * I commenced the third day of May, (1867,) with two horses, to prepare the land, and applied to each acre 250 pounds soluble bones, 165 pounds No. 1 Peruvian guano, and 100 pounds plaster, dropped in the bottom of the furrow. * * * I hired the picking of most of it at 40 cents per 100 pounds. The lot averaged about 3,000 pounds per acre, but owing to a storm, and other causes, I gathered only about 2,700 pounds, which will make two good bales per acre. In the lot was a potato patch, which had been twice manured and mulched with straw. I think that portion made at the rate of 6,000 pounds per acre. The next best place was about one acre of old pine field, first year, which made about 5,000 pounds. The cotton would have been better, planted 10th April. * * * I found, during the wet weather, where most manure was put it stood the rain best. * * * Below is the cost of one acre:

Cost of manure at plantation	$17 00
Horse two days at one dollar per day	2 00
Plough hand, two days, at 50 cents	1 00
Hoe hand, two days, at 50 cents	1 00
Dropping seed	25
Picking	10 80
Total	32 05

Against this small outlay stands a credit of 2,700 pounds seed cotton, equal to 818 pounds lint, worth $204; a clear profit of $171 95 per acre, or $2,751 20 gain, on a field of 16 acres. I wish the reader to bear it particularly in mind that this was done in 1867, the identical year in which so many thousands were ruined. They neither used manures nor ploughed with two horses.

As an additional and crowning evidence of what may be achieved, I mention that Mr. Dickson sent to the Cultivator a stalk of cotton, but three feet high, which had upon it 523 matured bolls. In Georgia uplands it is estimated that 100 bolls make a pound of seed cotton. Consequently this single stalk yielded 5¼ pounds. Reckoning a crop to stand 3 by 5 feet, we would have 2,904 stalks to the acre, which would yield 15,188 pounds seed cotton, or 4,560 pounds lint, worth now $1,140, net. I may be met by the sceptic with the assertion that this enormous production was due to accident, or extraordinary care and treatment. I deny the accidental part, and, if it was due to high feeding, will it not pay to feed whole crops in the same manner? Mr. Peter Henderson, of South Bergen, New Jersey, tells us that in order to take profitable crops of vegetables from his gardens he underdrains by 3 feet drains, placed 15 feet asunder; thoroughly subsoils once in 4 years; ploughs to a depth of 12 or 14 inches annually; and each year lays on a dressing of manure equal to 75 tons, or of bone dust 2,000 pounds per acre; and yet he does not claim so great a profit as $1,140 per acre, and his lands are worth probably not less than $2,000 per acre. Plant cotton on such land, and, my word for it, cotton is yet king—the most profitable plant yet grown by man on a large scale.

The exclusive system of cotton planting must give way to a mixed system of farming. Each and every farm must be made more than self-sustaining as regards provision crops, looking to cotton for the profits. The area of cultivation must be reduced; a thorough rotation of crops practiced, stock raised, and manures carefully saved, housed, and composted. Deep, thorough, and careful tillage must succeed the present shallow and slovenly culture. When these conditions are fulfilled we will become independent as regards our food crops, and the production of cotton will rapidly increase from year to year.

To treat land so as to obtain the greatest maximum crops would require a very considerable outlay of capital, which our people have not. But I insist that our lands may be brought up to the paying level by judicious rotation of crops, and by saving and utilizing the vast quantities of manures which now go utterly to waste.

The rotation I would recommend is that of five fields: First, all the manure for cotton, the land to be thoroughly subsoiled and properly tilled; second, corn after cotton, manured in the hill with ashes and such cotton seeds as are not fed to stock; third, wheat after corn, to be seeded with red clover or mixed grasses, and allowed to wait its turn in the five years' shift. Returning, the clover sod to be broken in the fall, and the land thoroughly subsoiled in the spring, manured and prepared for cotton, and so on as before. Under this system we may expect the greatest yield of all crops, and with the easiest cultivation. Crab grass, the cotton farmer's greatest enemy, perishes where the land is not cultivated continuously. Following grain and the grasses we find this pest exterminated. Cotton exhausting land but little, and the culture being "clean," we have every right to expect after it a bountiful corn crop, and thereafter good wheat and grass. I would not have more than 25 acres under this system to each reliable hand employed. From every acre we get food for stock. Cotton seeds, as oil cake or cooked, are of great value as food for cattle, reckoned in England, when decorticated, as equal, if not superior, to the richest grain. From the other crops we have corn and fodder, straw, bran, and hay. Hence, under judicious management, with stock enough to consume the products of the place, the amount of manure for the cotton land would not fall short of 30 tons per acre per annum; enough to bring the crop up equal to that of Mr. Dick-

son's four-acre lot; or, we will say, 10 bales of cotton to the hand; not an unusual production on the rich bottom lands of the Mississippi and Yazoo prior to the war. The following estimate of receipts and expenses for 25 acres may serve to further illustrate the system

RECEIPTS.

10 bales cotton, at $100	$1,000
300 bushels corn, at 50 cents	150
125 bushels wheat, at $2	250
10 tons hay, at $20	200
Total receipts	1,600

EXPENDITURES.

Wages and board of one hand	$250
Help at haymaking, cotton picking, and harvest	60
Feed of team, two mules, per annum	125
Seeds, &c	40
Wear and tear, and repairs	25
Total expenditures	500
Net profits	1,100

According to this system we are sure of a living and some money. As we are going now we are pushed to get the former and have none of the latter. Before closing, I may say that this system is based upon the theory of reliable and intelligent labor, and ample protection for crops and stock.

SOUTHERN AGRICULTURE.

The whole country is desirous of knowing the present and prospective condition of agriculture in the States which were directly involved in the rebellion and resultant emancipation. The people of those States are presumed to be still more anxious for a speedy return of agricultural and general prosperity. The more intelligent and progressive are fully aware that such prosperity must come through means and agencies adapted to the changed circumstances surrounding southern industry. From the first moment permitting the slightest action of this department, unremitting efforts have been made, so far as means and facilities were at hand for the work, to ascertain the pressing wants of this section, to furnish information and advice suited to the exigencies of the case and to initiate a new era in the history of its productive industry.

In the hope of obtaining facts of importance, and learning the views of the most practical men of the south, the following queries were directed to our regular corps of reporters and agricultural editors, and planters distinguished in their vocation:

1. Prior to 1860, what percentage of acreage actually cultivated in your State was annually planted in cotton? Please make this an average for a series of years.

2. What percentage was in corn?

3. What was the prevailing mode of culture, product of ginned cotton per acre and per hand, and profit of the crop?

4. What were the prices of labor per annum, in 1860, of men; of women; of youth of 14 years?

5. What were the prices for the same classes in January, 1867?

6. What are the contract prices of the same classes for the present year?

7. What changes in modes of culture, size of plantations, and contracts for labor, have been made since 1860, with comparative production and profit? Please give an accurate idea of the terms of different contracts, and indicate the comparative prevalency of each.

8. Please give individual cases of improved modes of culture, with successful results, including the name of proprietor, number of acres, mode and amount of culture, kind and quantity of fertilizers, and product of ginned cotton, with cost per pound.

9. Give instances of cotton planting by colored men, with results.

10. What circumstances affect the comparative profit of large and small plantations, and what number of hands would be likely to prove most profitable?

11. Give name and description of different agricultural implements now in use.

12. What facts have you tending to illustrate practically the saving of labor, reduction of cost of culture, or increase of production and profit, by the use of improved implements of husbandry?

13. The culture of what crops promises to pay better than cotton planting; and the reason why?

14. What are the inducements to stock-growing, and improvement of breeds of stock?

15. What suggestions would you commend to your neighboring planters as to the enrichment of their fields, the variety and proportion of crops to be cultivated, the improvement of their neighborhood, and advance in values of lands? What home resources for fertilization are available, as marls, lime, gypsum, &c.?

The responses to these inquiries afford the most gratifying evidences of a strong desire for improvement in agricultural processes, and the dissemination of just views of true agricultural economy. They are generally full, and often elaborate in the expression of individual views. While their hints towards improvement are locally suggested and various, there is less divergence in spirit, and an actually nearer approach to unity than could have been expected in the chaotic state in which all social and industrial elements of the south now exist. In the brief space allotted to this article it will be impossible to make many extracts from correspondence. The returns are necessarily so nearly alike that repetition can only be avoided by giving, in condensed form, an average expression of the statements and recommendations of all. The department is under great obligations for the care and fidelity with which its inquiries were met, and has filed for special and local reference all matter connected with the subject.

ACREAGE IN COTTON AND CORN.

The twin crops of the south, cotton and corn, have monopolized its tilled land, crowded out the grasses which are essential to permanent success in agriculture, and left 100,000,000 acres of "old fields" to the greed of hungry broom sedge and insatiable pines. In a small section of South Carolina and Georgia 170,000,000 pounds of rice have been grown; in Louisiana 220,000 hogsheads of sugar were made upon a narrow margin of river land in a few of the lower parishes of the State; and a moiety of wheat was harvested, two or three bushels only to each inhabitant of the cotton States. A beggarly list of other products might be specified, all occupying a percentage of the cultivated area scarcely computable. Cotton and corn have been planted in four-fifths of the tilled lands of the cotton States, and a large portion of the other fifth, assigned to other crops, has been found in the mountain sections of Tennessee, the Carolinas, and Georgia. The best soils of the Gulf region have

been so exclusively given up to these favorite crops that in plantations of hundreds of acres scarcely a single acre has been permitted to produce anything else.

An effort was made to ascertain approximately the proportion which these crops have respectively borne in former years to the total acreage actually tilled each year, and from the county returns the following averages are calculated:

States.	Cotton.	Corn.
	Per cent.	*Per cent.*
North Carolina	20	46
South Carolina	37	40
Georgia	43	40
Alabama	47	37
Mississippi	53	36
Louisiana	56	30
Texas	44	36
Arkansas	45	37
Tennessee	16	48
Average	44	38

The great fertility of Louisiana lands, mainly Mississippi bottoms, places that State at the head of the list, as to excessive cotton acreage, after making full allowance for cane culture. It is lowest on the corn list on account of the facility of obtaining corn from the western States; Mississippi stands next, both in excess of cotton and deficiency of corn. A verification of this estimate may be obtained from the census figures, which give 21 bushels of corn for each bale of cotton in Louisiana, and 24 bushels for one bale in Mississippi. The difference in acreage is still more apparent in view of the larger average yield of corn in Louisiana. As appears from the table the relative positions of the States are as follows: cotton, Louisiana, Mississippi, Alabama, Arkansas, Texas, Georgia, South Carolina, North Carolina, Tennessee; corn, Tennessee, North Carolina, South Carolina, Georgia, Arkansas, Alabama, Texas, Mississippi, Louisiana. The last is first; Tennessee, once the first corn State in the Union, heads the list, and it is curious to observe that the others follow in order exactly the reverse of that of the cotton list, except in the displacement of Texas.

MODE OF CULTURE AND PRODUCT.

The mode of culture before the war is too well known to require extended description. It consisted of ploughing in beds of four to six furrows each, more or less, in accordance with the size of the ploughs and the desired distance between the rows, sowing thickly in a drill opened in the centre of the bed, at the rate of two or more bushels of seed per acre, covering with a strip of board (screwed to the foot of a common shovel or scooter plough) made concave on the under surface, to fit the crest of the ridge, with sharp bevelled edges, a device which leaves a slight elevation to prevent saturation with water and dresses neatly the surface of the ridge; chopping out the surplus plants and all weeds on the ppearance of the third or fourth leaf, with the hoe, followed by a plough to round ꞁp the ridge and cover weeds, or preceded by it when the field is so rough as to expose the plants to the liability of being covered and smothered; ploughing again, and bringing to "a stand" with the hoe by leaving two plants (where but one is eventually allowed to remain;) and at the intervals of 20 days continuing to plough less deeply and closely to the plants each time, cleaning up with the hoe any remaining patches of grass, and keeping the surface of the ridge clean, mellow, and smoothly rounded.

The minor details of the culture vary with the circumstances of soil or season

and the peculiar views of the planter, but its main features are nearly invariable, and are founded on the practice of the best cultivators.

No radical change in the order of this culture, or in the general character of its processes, is looked for, though positive or marked changes are highly desirable in thoroughness and economy of culture; nor are persons hitherto unacquainted with cotton-planting expected to succeed best in it. The wisest of the old planters are the most successful cotton-growers; they are borrowing suggestions from other branches of agriculture, accepting hints of economy, and adopting labor-saving appliances, and they are reaping substantial benefits from their efforts in perfecting and improving the old practices; but the masses are not following except in squads, slowly and far behind. Many new-comers, after a season or two of trial, and sometimes sad experience, learn the business and infuse into it new energy and elements of success.

There are other questions involving the management and economy of labor, improvement in farm machinery and enrichment of soils, upon the solution of which depends the profit of cotton production, to a far greater extent than upon the order and peculiar mode of planting and cultivating; yet, small changes in these particulars will eventually facilitate and cheapen the processes of cotton culture. The practice of sowing by hand, now in so general use, will give place to seed planters, and the covering will be accomplished simultaneously. The present modes of covering are various, some of them rude; they include the concave board, the notched block, a forked plough or arrangement of two scooters, the harrow, and a plough followed by a block, to obviate the effects of deep covering. The improvements needed in ploughs will be considered in another chapter.

Yield.—The average yield of cotton per acre has never been ascertained by an actual census. As with corn and wheat, the real average is not half the product commonly realized by the best cultivators, and not one-fourth the quantity a good soil, rightly managed, is capable of producing. The local returns upon this point are quite full, and doubtless nearly correct, though probably too high rather than under statement. Averaging them, with due regard to prominence of States and sections of States in this production,* the following table is obtained, showing the estimated average product per acre, and the average product per "hand," or laborer:

States.	Product per acre.	Product per hand.
	Pounds.	*Pounds.*
North Carolina	160	1,475
South Carolina	145	1,400
Georgia	170	1,530
Florida	165	1,525
Alabama	175	1,620
Mississippi	195	1,825
Louisiana	250	2,200
Texas	225	2,150
Arkansas	240	2,175
Tennessee	165	1,640
Average	190	1,750

This exhibit places the States in the following order, as to yield per acre: Louisiana, Arkansas, Texas, Mississippi, Alabama, Georgia, Florida, Tennessee, North Carolina, South Carolina. The plantations in the first two States are

* For instance, of 86 counties in Tennessee, scarcely one-third have ever produced cotton as a market crop, and the largest portion of the yield of any year is obtained from half a dozen counties.

mostly Mississippi bottoms, unsurpassed for fitness in the world. The Texas cotton fields are on the Red River bottoms, and alluvial soils of other river valleys of southern Texas. Mississippi has cotton lands on the Mississippi, Big Black, and Yazoo rivers, as good as the best of Louisiana or Texas, and also has thousands of acres in the eastern and southern parts of the State, of moderate fertility, which tend to reduce her average. Alabama naturally comes next in order, and the Carolinas, with the most depleted, ravaged, and depopulated cotton plantations of the country, close the list. The highest average is but half a modern bale, the lowest less than a third, and the general average, 190 pounds, is quite as large a figure as the truth will warrant.

Some of the most productive counties on the Mississippi river report 10 bales per hand, or 4,800 pounds, or almost three times as much as the general average; and the same localities cultivate additionally to the hand, five acres in corn, yielding 35 bushels each.

The order of the average product per hand in the several States corresponds with the products per acre of each, except Tennessee. The general average per hand, 1,750 pounds, makes the average cotton area per hand between nine and ten acres.

PRICES OF LABOR.

The returns relative to the prices of labor in 1860, and for the last two years, are of much interest, showing the effect of fluctuations in value of products, the difference in productive value of soils, the result of local competition for labor, and other causes.

In the following table of wages per annum, rations and clothing are included with the money in 1860, rations without clothing in 1867. The rations consist principally of bacon and meal; three and a half pounds of the former, and a peck of the latter. The clothing comprised two suits of summer clothes, two pairs of shoes or one of boots, and sometimes a pair of blankets. In the term "youth" are included children of both sexes, of not less than fourteen years. There is difficulty in obtaining strictly true averages, from the differing conditions in employment of labor, and the uncertainty that a return fully represents all such peculiarities, but the result suffices to show the feverish excitement in cotton-planting in the beginning of 1867, along the Mississippi river, in Tennessee, Texas, and Georgia, and the collapse of a year later, when prices ruled low, a burdensome tax was imposed, loss and bankruptcy were rife, and gloom overspread the planting community. The table is as follows:

States.	1860.			1867.			1868.		
	Men.	Women.	Youth.	Men.	Women.	Youth.	Men.	Women.	Youth.
Virginia	105	46	39	102	43	46	102	41	45
North Carolina	110	49	50	104	45	47	89	41	39
South Carolina	103	55	43	100	55	43	93	52	42
Georgia	124	75	57	125	65	46	83	55	47
Florida	139	80	65	139	85	52	97	50	44
Alabama	138	89	66	117	71	52	87	50	40
Mississippi	166	100	71	149	93	61	90	66	40
Louisiana	171	120	72	150	104	65	104	75	60
Texas	166	109	80	139	84	67	130	72	65
Arkansas	170	108	80	158	94	78	115	75	67
Tennessee	121	63	60	136	67	65	109	51	45

Wages.—The payment of wages—a plan tried extensively in 1866—generally proved unprofitable, the freedmen being inclined to use too freely their newly-found liberty, and planters were generally quite as little at home in the management of free labor. Much of the labor was inefficient; idleness became contagious, of a more malignant type in proportion to increase of numbers work-

ing together, crops were neglected, upbraidings and threats sometimes followed, and the cotton fields were in many cases left in the lurch at the critical season of picking. Other plans had been followed, and promised to be more extensively adopted. One of these was

Renting.—The rent is sometimes agreed to be paid in money, but generally in a stipulated portion of the crop, usually one-third. In parts of Texas, one-fourth of cotton and one-third of grain crops, is a common rent. In some parts of Tennessee, as in Polk county, more farms are taken for rent than on shares. It is asserted that persons renting good lands "at halves," often do better than to get two-thirds of the produce of poor farms.

The most prevalent and popular mode of contracting proprietors and laborers is—

Working upon shares.—Great diversity has existed in the form and character of contracts. Few freedmen have means to provision themselves, and exceedingly rare are the cases in which they can obtain credit for any supplies whatever. Therefore, whether they engage to furnish rations with their labor, or half of the feed for horses or mules, these supplies are all charged, the aggregate to be deducted from their share of gross returns. The mode of contracting preferred in 1867, in South Carolina, required the payment of one-third of the crop to the laborer, who furnished his own rations. A similar arrangement was common in Georgia, where, also, many plantations were rented for half, all expenses to be borne equally by planter and laborers. In some parts of Florida, labor was furnished with all supplies except clothing, and paid one-fourth of the crop, or one-third of the crop without rations. In Marengo county, Alabama, a region of fine plantations, one-fourth for labor is the rule, or one-third without rations; and similar rates are offered for the cultivation of other rich soils in Alabama, Mississippi, and further west, while somewhat better terms are given to labor in less productive locations. In Amite, Mississippi, labor and board are made equivalent to farm and stock; in Greenville, Mississippi, one-fourth is paid for labor, one-third for labor furnishing its own supplies, and one-half if the expense of forage is shared by the laborer; in the vicinity of Louisville, three-tenths of the crop is given for labor; on the Yazoo river, one-fourth of the gross product is paid for labor furnished with rations; in Tippah, Mississippi, the farm tools and stock are an equivalent for labor, rations, and feed.

Profits of labor.—The results of planting in 1866 and 1867 were, in most cases, disastrous to planters, and disappointing to laborers working on shares. In some sections, the entire crop, as is asserted of the majority of plantations, did not suffice to pay laborers and their food and clothing, yet the price of labor might be lower than in 1860, though it would have been higher, but for its comparative inefficiency. The general complaint is, that labor has proved unreliable, unprofitable, and vexatious. There is no doubt that freedmen's labor, in this transition period, has yielded lower results than the compulsory labor of 1860. This was to be expected. To presume that ignorant slaves, herded in masses, released from all control except the restraints of statute law, should at once become models of industry, frugality, and foresight, is to accredit to them a higher wisdom than could be expected of their masters in their new relations.

Both parties have much to learn, many errors of policy or practice to renounce, and success to win, by a better understanding of the means for attaining it. This correspondence has proved such success attainable, and already attained by a few persons, who not only had the confidence of their laborers, but directed and supervised their labor, with a full understanding of the altered conditions of cotton-planting, and a high appreciation of the required changes in its economy.

It has been declared by representative southern men that negro labor is the best on the continent. It is best in the south at present, because, rude as it may be, it is almost the only skilled labor for cotton culture. When white men, in any considerable numbers, become practically acquainted with the processes

of cotton-growing, their labor will probably prove superior. A very few white men in the cotton section are engaged in the labors of agriculture. When the absurd prejudice of the poor man against the labor necessary to raise him to comfort and competency no longer finds a place in the bosom of the white man, there will be no lack of production for home supply, or for export, and the waste places will be built up, and prosperity and abundance will bless the land.

CHANGES IN CULTURE AND MANAGEMENT.

It would be gratifying to be able to say that better culture, greater economy in agricultural processes, a general practice of fertilization, and a thorough adaptation to changed conditions have already obtained; yet it would be absurd to expect it at once or under existing circumstances. It is enough to know that an unusual spirit of energy is awakened, which has already begun to yield valuable fruits, here and there, at isolated points throughout the southern States. The agricultural mind is wakeful and active. Intelligent and practical writers enrich the agricultural press with advanced ideas. In the Carolinas and Georgia commercial and artificial fertilizers are used to a very great and increasing extent, and their comparative value, mode of application, and results upon different soils, are more eagerly canvassed than ever before. It is but fair to say that pecuniary inability has proved a bar to improvement dictated by the deliberate judgment of many planters.

An instance or two of successful planting will serve as an example of progress, to which the most conservative are compelled to look. The gentleman mentioned by Benjamin T. Harris, our correspondent in Hancock county, Georgia, in the following extract, has long been known as an exponent of high culture:

> David Dickson, of this county, has produced the most successful results in growing corn, cotton, wheat, oats, potatoes, &c., on a large scale, for the last 20 years, of any one in this vicinity. He originated the mode which he has so successfully pursued and which is now generally followed. It is peculiar only in the fact that he gives more distance, both to corn and cotton, than was formerly given; that he has used more commercial manures, ploughed deeper in the preparation of the ground, cultivated shallower, and with more care for the young plant, especially, and more land per hand and per horse, than our planters generally have done. It is but just to him to add that these results were obtained with more satisfaction to himself and laborers than is often found on other plantations. He uses Peruvian guano, bone-dust, plaster and salt, combined or mixed, under his own watchful eye, with such domestic manures as can be economically raised and applied. He made, in former years, from 3,000 to 5,000 pounds of ginned cotton to the hand, with a superabundance of corn, pork, beef, wheat, oats, potatoes, cheese, watermelons, &c., &c., for his own use and for the use of his negroes, and to sell to others who were not so fortunate. Like all others in the country, he cannot now produce the same results with the same number of laborers.

Mr. Dickson pulverizes the soil thoroughly in preparation for cotton, and manures an acre (when expecting the best results) with 160 pounds guano, 240 pounds dissolved bones, 100 pounds salt, and 160 pounds plaster, thoroughly mixed, costing about $16, the mixture deposited in an eight-inch furrow, which is covered with a long scooter running deeply on each side, leaving a rich and mellow seed-bed. He cultivates cleanly with sweeps and uses the hoes once or twice. His crops are remarkably reliable, the most destructive casualties causing only partial failures; and though he often suffers from worms or drought, he rarely gets less than a bale per acre, and oftener obtains nearly two. Mr. Dickson purchased, in 1867, Peruvian guano to the amount of $12,000, and found the investment a profitable one. Whether this profit might not have been more cheaply obtained by making at least a portion of these fertilizers upon the farm is a question pregnant with meaning to southern farmers.

James Davison, of Greene county, Georgia, experimented quite extensively last year with stable manure and several of the commercial fertilizers. The experiment with Peruvian guano increased the yield 140 per cent. when compared with the yield from the same quantity of land without fertilizers. Common wood ashes and salt gave an increase of 200 per cent.

Large results have been obtained upon poor soils by fertilizers. An instance is reported from Onslow county, North Carolina, of a product of 2,700 pounds of seed cotton, or about 800 pounds of lint from one acre. The cotton was cultivated in the usual way, the land highly manured with a compost manure containing a large percentage of stable manure. Other cases are reported from "the old north State." A. B. Davis, of Carteret county, produced in 1867, from an acre of land, 2,300 pounds of seed-cotton, using for manure fish only, which he caught himself. Calvin Tucker, of Pitt county, also produced from one acre 2,300 pounds of seed cotton, using barn-yard manure, shell lime, and leached ashes. J. T. Pearson, of Wayne county, produced from one acre 2,200 pounds of seed cotton, using with barn-yard manure, cotton-seed and Baugh's superphosphate of lime. R. W. Pelletier, of Lenoir county, produced from one acre 2,061 pounds seed cotton. The mode of cultivation in these cases was not unusual, the increased yield being mainly due to the fertilizers used. The season was an unfavorable one, and the yield would have been much larger in a good season. Instances are given of similar increase of production in other farm crops, as the cereals and roots.

B. F. Ward, of Butts county, Georgia, gives his experience in the management of freedmen as follows:

In 1866 I gave my laborers, all negroes, $120 as wages to men, and $75 to women and boys, and fed them. Some worked as well as I wished; about one-third would not work unless I was present, and then not cheerfully or well. I lost my provisions of corn and meat, and made about enough cotton to pay them their wages in full. I settled with them fairly; all were satisfied, and wanted to stay another year. They were all worked together. I selected for the next crop those with families who worked well, and turned off the drones. I kept married men altogether. I had a great many applications to hire, which gave me choice of the laborers around, and got as many as I wanted to work my land. I then divided them into squads and families, or let them make selections of their own co-workers. I measured off to each squad a portion of land, and gave a mule to each two workers. I gave them one-half the corn and fodder, peas, potatoes, sorghum. melons, and half the dried peaches, and one-third of the cotton. I fed the plough stock, and they fed themselves and found their own clothing. They went to work very earnestly. The heads of squads were good practical farmers. I had rented a portion of the land to white laborers, and I was soon enabled to get up a good state of excitement and ambition to excel in the quantity of crops to be made. The negroes worked well, and made good crops. Some made 300 or 400 bushels of corn to the hand, and some from three to five bales of cotton per capita, besides large quantities of potatoes, and about 250 gallons of sirup in all. We sold over 700 pounds of dried peaches, besides what was kept for home consumption. They were to furnish their own provisions, but by about the middle of June all except two had applied to me for meat, and some for corn, and some for both. I referred them to our contract; they acknowledged its terms, but said it took more to feed them than they thought for; they had "eat up all their meat, and their money was all gone too." I had to supply them or lose the crop; I furnished them, of course. They did very little after the crop was laid by until time to gather it. They finished gathering before Christmas.

The following from R. H. Springer, of Carroll county, Georgia, furnishes another illustration of the benefits derived from judicious management of co-operative freedmen:

In 1866 I employed freedmen and gave them one-third of all that was made. I furnished everything—land, tools, horses, seed, &c., but I found that was hardly enough, although they worked well. In 1867 I gave them one-half, and only furnished the land and stock, and fed the stock, they being at all other expense. They repair my fences, clean out my ditches, and keep the plantation in good order. This plan worked well. My plantation looks better than ever before; the freedmen work better, and make an abundance to supply themselves and families. I am at but little trouble, and, if anything, they are working better this year than ever. They repair and keep up the plantation at times when they would do nothing else; therefore it is no expense to them but labor, and a great saving to me. I will add that this plan is being rapidly adopted by the farmers of this county. Freedmen would do much better if there were not so many villians prowling over the country seeking to swindle the negroes out of their hard-earned wages.

Mr. Springer cultivates cotton at the cost of 10 cents per pound, getting four bales per hand, besides grain, peas, potatoes, and other crops.

Dr. Tanner, in the same county, obtained 500 pounds per acre on very poor land by the use of stable manure.

A planter of Johnson county, Georgia, cultivates 1,500 acres, with fertilizers made by supplying his own stables with pine straw. His cotton is estimated to cost but six cents per pound.

Dr. S. P. Burnett, of Fort Gaines, Georgia, manured 25 acres of poor pine land, and obtained 18 bales of 500 pounds each, costing six cents per pound.

In Tatnall county, Georgia, an experiment with guano resulted as follows: 7 rows, with guano under the ridge, 331 pounds; 7 rows, with an equal quantity on the surface, 246 pounds; 7 rows, without guano, 104 pounds.

The product of the soil has been increased one-third in Clarke county, Alabama, by the use of superphosphate of lime.

Albert Crumpler, near Childersburg, Talladega county, Alabama, cultivates 15 acres per hand, 10 in cotton and 5 in corn, bedding high, manuring in the drill with a compost of stable manure and muck. He obtains an increase of one-third by the use of guano. His cotton is estimated to cost 11 to 12½ cents per pound.

Instances of intensive culture are reported in Mississippi and other States. Fertilizing is little practiced except in the Atlantic States. The alluvial soils of Alabama, Mississippi, Arkansas, and Texas, are practically regarded as inexhaustible, and are cropped continuously, with little fear of exhaustion. It has not been discovered, however, that manures occasion any injury in such locations.

There is not only an expressed intention of diversifying agriculture, but a few are making efforts in that direction, neglecting cotton, or wholly discarding it. Thomas R. Tennison, of Clark county, Arkansas, illustrates the views and practice of this class:

I cultivate about 80 acres, one-half bottom land, the other rolling, sandy land; about 40 acres in fruit—apples, pears, peaches, plums, cherries, and a general variety of small fruits, all of which do extremely well here. I have a barn, cotton-gin, mill, wood-saw, (cut-off,) sugar mill, and evaporator, sulky plough, double shovels, Collins and Co.'s cut steel ploughs, Geddes' harrow, cotton planter, corn planter, one Avery, No. 8, and, perhaps, one bull tongue.

I use barn-yard and stable manures, incorporated with swamp muck. I have, also, a bank of shell marl, which is abundant in all parts of this county, on which I draw occasionally. We use all our spare cotton seed, also, as a fertilizer. I find by experience that a corn crop can be doubled by using rotted seed, a handful to the hill. The above is the only farm I know of where an improved implement is used, or has a barn or shelter for stock, or uses a level on hillsides. As I have no disposition to gamble, or invest in lotteries, I do not raise cotton.

Every variety of farm product for use and for sale, fat stock, no debts, and money in pocket, are indications of my way of striking a balance in favor of the improved mode and implements.

PLANTING BY COLORED MEN.

The general tenor of information upon this point is that such efforts have usually resulted in failure. It should also be remembered that failures have been more numerous than successes among whites, as shown by the same returns. The difficulties to be encountered have been not only worms, excessive rains, droughts, floods, and fields overrun with pernicious growths of neglected years, but inexperience in business calculations, a proverbial lack of foresight in the uneducated plantation negro, a prodigal hospitality while a pound of bacon or a bushel of sweet potatoes remains, and an inability to appreciate the economic value of passing time. There are instances enough of thrift and foresight to refute the proposition that the race is and must be incapable of business management, when time and opportunity for such practical education shall be enjoyed; at the same time it is shown to be unwise, in view of the overwhelming evidence of their present unfitness to manage plantations, to advocate the undertaking of cotton planting or general farming by the freedmen generally. If there are any ambitious enough to brave the risk, with money enough to make a commencement, they should be permitted the trial; but the "hands" generally should be encouraged to work for wages until they can test their ability to manage for themselves, at

least to the extent of economizing their earnings, and saving a surplus for the contingency of the future in a life of freedom.

A sufficient number of the various classes of reported experiments to give an accurate idea of the import of the returns will be briefly presented. A repugnance to cotton culture was early evinced, which rendered it difficult at first to contract for their labor, and prevented engaging in it on their own account. They knew it meant work from January to Christmas, and work was not the idea of freedom which they had received from the inculcation of example or the teaching of observation; to be free was to hunt and fish, and lounge about the county town; to the women it was to desert out-door employment, and ape, in a slight degree, the fashions and habits of the more fortunate white race. Those having the disposition to labor were encumbered and impeded by gossiping idlers.

Failures.—Among the many cases of unsuccessful planting reported, is one of a black man in Mississippi, who lost $10,000 in an attempt to cultivate cotton. Another in Amite county, Mississippi, hired five or six hands, obtained credit for farm stock and utensils, and in two years was left in debt between $1,000 and $2,000. Another in the same county who had formerly managed successfully 18 hands for his master, and who was deemed an intelligent and excellent manager, went to work with a force of 17, four being women, and three youths; rented fertile bottom land, agreeing to pay one-third of the product as rent. He bought of his landlord two mules, four horses, eight cows, and borrowed four yoke of oxen, a wagon, 1,200 pounds of bacon, 40 bushels of corn, 3,000 pounds of fodder, and obtained credit for $1,000. He obtained four bales of cotton, raised no corn, fodder or vegetables; both mules were dead at the end of the year, two horses were run off and sold, two yoke of oxen reported dead, one yoke of oxen and two horses turned over to the landlord so poor they could scarcely stand, and no rent or debts were paid, and $500 debt was further incurred.

Such an occurrence as the following has been common: A planter who had furnished a yoke of oxen and a cart to a freedman, who had four children to help him in the field, seeing him on his way to a neighboring village with a small load of wood, and knowing that his little cotton farm was rapidly going to grass, asked him, "How is this?" "Oh! I an out of tobaccy, and am gwine to town to sell a load of wood." His wife was housekeeping, and his four children had gone fishing. His cows brought him two calves, but he lost both because he was too indolent to mow a small quantity of hay and pea vines. The veteran agricultural editor, Dr. M. W. Phillips, of Mississippi, gives the result of extensive observation, declaring that the freedman may have a third, a half, or even an entire interest in a crop he is cultivating, and if any one will give for a week, or for a single day, more than usual rates in cash, he will leave the crop in the grass, and earn a few dollars to spend "for some trifle that would only please a child." In portions of Arkansas, it is asserted, only the poorest hands who cannot get situations set up for themselves.

From Alabama come reports that their management of farms has proved 33 per cent. less effective than that of whites; and one correspondent says they do not produce a bale to the hand.

Reports of farming by freedmen in Avoyelles, Louisiana, represent the colored managers as "the choice of the ex-slaves;" that "they work steadily, but lack foresight, as in their race generally." A correspondent in the parish of East Feliciana, Louisiana, writes:

In every instance within my knowledge where colored men have attempted to raise cotton, or to cultivate any other product whatever, on their own account, they have entirely failed, and those furnishing them with supplies have invariably lost money. The restraint of former times being removed they are not yet adapted to the new state of things, and cannot bear to be confined to regular labor. Their disposition is to be content with the most precarious subsistence; where left to themselves they reside in huts, and live upon small game and corn meal.

A correspondent in Washington county, Mississippi, where the soil is as fertile as the valley of the Nile, says he had four squads of freedmen at work, each squad consisting of ten hands. One party raised 31 bales of cotton; a second 25; a third 22, and the fourth 12, all averaging 430 pounds each. The net proceeds of the cotton would not pay the expenses. In every case within his knowledge the planter having his work done for a share of the crop lost money and the freedmen were unable to pay for what was furnished; and all independent attempts at planting by freedmen brought them into debt. Many cases are mentioned of industrious men, successful managers for years, under direction of the masters, who had failed to produce enough to pay expenses. Many writers concur in stating that they do not know of an instance in which a freedman would have anything left after paying his debts. The following statement concerns a region in which farming is more diversified. The writer, of Stanley county, North Carolina, gives both unpromising and favorable data upon the subject:

A neighbor was keeping, in 1860, six male hands, with two women, and three or four children, on a plantation containing 80 acres of bottom land, and as much upland. These hands and their overseer, with the help of six head of mules or horses, were in the habit of making yearly 20 bales of cotton, 150 barrels of corn, 50 bushels of rye, besides roots, hay, and garden vegetables. Last year he divided his farm into three lots, gave charge of one lot to one of his former slaves, the most intelligent among them, who has a wife and four children able to do good work. The landlord found two mules, their feed, and all the necessary implements. The freedman found himself and family, and was at no other expense. The whole management of the crop was left to him. A second lot was intrusted to two good hands, with their wives—also two mules, as with the first. The third lot was left to the owner's son, who hired a black man for a part of the crop. The three lots were tolerably well laid off as to equality of fitness for the crops to be made. One-half of the crop was the stipulated rent. All went to work, each left to his own judgment. They made corn, wheat, oats, and cotton. I went through the crop several times while it was growing. A worse condition of things had never been seen on the premises on the part left to the management of the freedmen. The small grain in many places was choked with bushes and briars; the grass and weeds gained and kept the upper hand everywhere. At the close of the year the two families of colored people had made less than 20 barrels of corn each, 30 bushels of wheat, 50 bushels of oats, and two bales of cotton each. The owner's son, with one helper, made as much corn, wheat, oats, and cotton as the other two sets of tenants put together. The whole crop was not worth more than half the value of the crop of 1860. The colored men went into debt so largely for provisions and otherwise, that but a few bushels of the corn and wheat falling to their share was left them; the price of the cotton was nearly all absorbed by the advances made during the year, and there was nothing left whereon to make another crop. The result was that of their own accord the colored men entreated the son of the landlord to take everything under his control. On that condition they are farming this year on the same premises.

On the contrary, two families of colored people, composed of six hands, two women and two children, undertook to make a crop on a plantation where some 75 acres of middling bottom land alternate with 50 acres of upland. They worked bravely, listened with docility to advice in regard to their work, and the result, in spite of adverse seasons, was 100 barrels of corn, 200 bushels of wheat, 100 bushels of oats, 25 bushels of peas, 75 bushels of potatoes, and 4,000 pounds of ginned cotton. The value of that crop in 1860 would have been $1,200, but is now equal to $1,800, the half of which falls to the share of the freedmen, as per contract. They farm this year on the same premises, with their own horses and feed, and pay the landlord such rent only as any white man would have to pay under the same circumstances.

Successes.—Comparatively few cases are mentioned. Among them are the following: A freedman in Johnson county, Georgia, cultivated with his own hands 25 acres of cotton, and made 15 bales averaging 480 pounds each.

In Lauderdale county, Mississippi, an intelligent man procured two horses in 1866 and made six bales of cotton on rented land, coming out $100 in debt. He retained the same hands in 1867 and made nine bales cotton and was $200 in arrears, but has paid off old scores and says he will try it again. He had corn and forage sufficient for the season, and is getting a stock of hogs and cattle. The reporter believes he will eventually succeed.

An Alabama freedman produced 500 pounds of cotton on a small farm of his own by working in leisure hours at intervals of regular service.

A correspondent in Ellis county, Texas, writes:

I have had 10 or 12 negro families cultivating land—generally on the shares. All planted cotton. Only one made a respectable crop. He was a very old man, formerly a foreman, and off three acres he raised three bales, and nicely picked it so as to class a strictly "low middling" in market. I know of another who did justice to his cotton crop. He is a neat farmer, and is respected by all who know him. My other hands hardly averaged 700 pounds of seed cotton per acre.

A freedman in Georgia cultivated seven acres in cotton and 23 in corn, and three in other crops, with his own labor and that of one horse. The work was accomplished with ease. The corn and cotton he kept clean, and no help was required or delay suffered.

All these facts show many difficulties to be encountered, valuable capabilities to be improved, and a splendid opportunity for the exercise of patience, humanity, tact, wisdom, and a genius for reducing order out of chaos. The task is difficult—the prospect of ultimate success hopeful.

SIZE OF PLANTATIONS.

The views of correspondents as to the number of hands most profitably employed on a plantation generally hinges on the reliability of freedmen's labor. If planters could obtain and profitably manage large numbers, most of them would now, in obedience to the prevailing custom of the country, hire as many as their means would provide for or their land would keep employed. While many intelligent planters deprecate the insane pursuit of one object, tending to decrease the value of one product and enhance the price of all others, the great desire for immediate returns, and the general ignorance of all cropping, except that which brings cotton and corn, combined to make cotton, if not so much a specialty as formerly, the great resource still for ready money. Yet all are compelled to yield to the fiat of inexorable circumstances. Large planting operations have been tried and failed. Smaller undertakings have generally succeeded; and small farms, cultivated with the constant supervision of an intelligent and industrious owner, have always as a rule brought comfort and prosperity, and always will. It must be admitted, however, that this superior profit of small farms depends on the greater economy of labor under the eye of the farmer. If it is possible, as it may not now be generally in the south, to secure actual performance of service in full proportion to the number employed, the larger the farm the greater the profit. As in the case of a large hotel or manufactory, where perfection of system is attained, the profit would be increased in greater proportion than the increase of acres or capital. As one writer remarks, "an engine will grind the meal, gin the cotton, and do the sawing" on a large farm as well as a small one. The answer to this question, therefore, depends not only on the comparative reliability of different families or groups of freedmen, but on the farmer's working capital and his capacity.

The estimates of the proper number of hands, under present circumstances, are quite various, as might be anticipated. Each correspondent, from his own standpoint, reasons plausibly, and perhaps judges accurately. One deems 30 a profitable number, because he has seen 30 managed with profit. Another in his vicinity has witnessed failure on large plantations, and success with a single family or two of freedmen, and he suggests three or four unhesitatingly; others think 10 a judicious medium, or perhaps 15 or 20. The reasoning on this point is copious and interesting. An extract or two only can be given:

The congregating of a large number of freedmen on large plantations, solely with a view to obtaining their labor, and as much of it as possible, with the least outlay, without affording opportunity for education and moral improvement, has resulted in disagreement, insubordination and loss to all parties concerned. A few colored people employed by a white family, or in a neighborhood where there are but few freedmen, educate themselves rapidly, and adopt the habits and morals of the whites around them.

Where jealousies or quarrels do not spring from associating large numbers, many complain of the very common evil of shirking, as in the following homely but unequivocal terms:

With a large number of hands, one does bad work, another follows suit, until all get to cheating—so many the boss can't tell who does the bad work.

A correspondent says: "The less the better—better if none at all."

Another would employ a large number upon the following plan:

I would state that my hands this season are working in squads of from three to nine, and if I was able I would divide land into small lots, and put a comfortable house on each lot, have a school house and church in the most central part, and I would compel all children to go to school and pay for the same by working in the crop. And I would force them to go to school and to work.

IMPROVED FARM IMPLEMENTS.

The instruments used in cotton culture have been exceedingly rude. Until within a few years, most of them have been made in neighborhood blacksmith shops, and often by the blacksmith of the plantation, in a style which was the excess of bungling. Some of the implements were of peculiar form, not in use in other sections of the country, as the scooter, or bull-tongue, a straight strip of four-inch bar iron, pointed and bent; and the sweep, cleaning and stirring from 18 to 32 inches of surface, is universally popular. These implements are, doubtless, susceptible of great improvement; if of the best form, they can be far more regular in curves and smoother in surface, and of better material, working with less power, and lasting longer. Then there is the "scraper," the "half-shovel," "shovel," "gopher," and other peculiar forms of implements. The turning plough, used in bedding-up, has already been greatly improved, though the improvement has not been sufficiently disseminated. Steel ploughs are beginning to come into use. One correspondent says he would as soon think of using an iron axe as a plough all iron. A great variety of ploughs is reported, of local or general popularity, as the "Collins," "Brinly," "Avery," "Dodge," "Livingston," "Taylor," "Allen," "Calhoun," "Duvall," "Miller," "Mohawk Clipper," "Carey," "Watt," "Brooks" subsoiler, and others. Gang ploughs and sulky cultivators have recently been introduced, but have not become popular. The complaint is made that they "do not kill the crab-grass" and thoroughly clean the rows.

The opinion is expressed by some correspondents that greater care in breaking up and laying off the land would facilitate the use of these implements, and greatly reduce the cost of cultivation. Knox's horse-hoe is popular where introduced. The Scovil hoe is frequently mentioned very favorably.

Dr. M. W. Phillips, of Mississippi, in discussing the economy of "cotton planters," says he can open the furrows, and drop and cover as many acres by the use of this implement as can be planted by double the force in the old way; and also, that with a horse-hoe he can cultivate as well and nearly twice as much as with a turning-plough. He believes that a large field can be kept cleaner with the sulky cultivator than with any other implement, but that two horses cannot properly prepare land enough to keep it going. This is a subject of great importance, demanding separate and full discussion. It is evident that a great impetus has recently been given to the use of improved forms of implements; that many of them may require particular adaptation for use in cotton fields; that there is much prejudice yet to overcome in securing their general introduction; and that they are destined to cheapen the cost and enhance the profit of southern agricultural production.

IS COTTON THE MOST PROFITABLE CROP?

In districts where cotton has long been produced exclusively, the predominating opinion is that it is the most profitable crop. In localities in which failure has marked the record of the last two years, doubts are expressed of its superi-

ority in this respect. Some assert that "anything is more profitable." Want of experience with other crops has evidently influenced the opinions of many in favor of this staple product.

There is a growing tendency to enlarge and extend into new districts the area of sugar-cane planting. Florida and southern Georgia are regarded as promising sections for this purpose. In Conecuh county, Alabama, the following comparison is made:

J. M. McIntire planted one acre in sugar-cane, and 20 in cotton. The one acre in cane made seven barrels of molasses, at $1 25 per gallon, and 1,000 stalks for seed, altogether worth $400. The 20 acres in cotton made six bales, which sold at 12½ cents per pound, and netted $375. The cane did not require any more labor than one acre of cotton.

Returns from Louisiana indicate a revival of the sugar interest, and point to an increase of 100 per cent. in 1868 over the crop of 1867. In the parish of Avoyelles, last year's area of 150 acres of canes will be increased to 600 acres, all the canes being reserved for planting.

A correspondent enthusiastically claims north Louisiana as "the best grape and peach region of the world," and that fruit culture will displace cotton-growing there. Strawberries begin to ripen by the 23d of March; the Scuppernong family of grapes never fails, and figs are prolific and hardy.

The *Palma Christi* (castor-oil bean) is very profitable in Texas. It grows spontaneously in some parts of the State. The Cameron county correspondent deems it the crop that will ultimately enrich the Rio Grande valley. Stock-growing is also mentioned as promising better profit than the prevailing culture.

The average product per acre—190 pounds—as deduced from these returns, is not a very remunerative exhibit. At 15 cents per pound, an acre would produce $28 50, and each laborer, at an average of 1,750 pounds, would "make" a gross earning of $262 50. An acre of wheat, at the average for 1867, throughout the United States, is worth $23. If the estimate given in the statistician's report of $33 per acre, based upon a somewhat higher price of cotton for the past year, be taken for this comparison, the advantage will still be largely on the side of wheat, in view of the wide difference in the labor required in the culture of these crops.

A wide field is opened for comparison, which may profitably be entered in the future. It is safe to assert, without further investigation, that cotton will always constitute a profitable element in the future system of farm rotation of the south.

STOCK-GROWING.

The testimony to the value of this part of the country for stock-growing is voluminous and convincing. Little has been done in this direction; the predatory character of a portion of the population has, in many places, reduced the stock of hogs and sheep to a minimum. The climate and products of this region are, in many respects, admirably suited to the cheap production of meat and wool. Swine can be profitably fattened on such luxuries as peaches and sweet potatoes. Of the entire stock of domestic animals, in certain sections of the cotton States, less than one pound in every hundred is produced by feed furnished by the care of man. In the area between the Yazoo and Mississippi rivers, inhabited in 1860 by less than 9,000 whites, in which 428,000 acres were in cultivation, there were then 87,000 hogs, 10,980 sheep, and 69,260 cattle, all raised without care, with no reference to a market, entirely for home consumption. Fortunes are made in Texas by rearing cattle for sale at $5 to $10 per head. That the business of stock-growing will be greatly extended within ten years and be found very remunerative, may be considered certain. With laws for protection against the ravages of dogs, the south can easily supply the entire country with wool, and furnish an equal amount for exportation at a better profit than has ever been obtained in the culture of cotton.

SUGGESTIONS TOWARDS IMPROVEMENT.

Every intelligent correspondent presents some judicious suggestions of improvement, in accordance with his own practical education, and the peculiar circumstances of his neighborhood. There is abundant evidence of a change of views, more or less wisely suited to changed circumstances; and with all the diversity of climates, soils, and other elements of production in agriculture, which influence individual opinions, there is a degree of unanimity in views of what shall constitute a reformed system of culture, that proves unerringly their truth and wisdom. Adopting them so far as they appear reasonable, and in accordance with the true principles of culture, as recognized in the practice of scientific farmers of this and other nations, the following hints for the agricultural reconstruction of this section are presented:

Reduction in size of farms.—In all countries where land is cheap, there is a tendency to attempt the cultivation of too large an area in proportion to capital and labor — a course which leads to impoverishment and ruin. A working capital of $50 to $100 per acre is required in England, aside from the value of the land, which is seldom owned by the farmer. In the south the landholder should have at least a sum equal to the average value of the farms of that section, for expenses of stocking and working. Failing either in sufficiency of money or labor, he should sell land enough to obtain it, whether it be a fourth, half, or even three-fourths of his present farm. Land without labor is worthless; and if the coming of laborers is awaited, in the expectation of accruing wealth in real estate, while the owner refuses to sell, his ultimate loss will exceed by far a present sacrifice of half his estate.

Diversity in production.—While cotton may ever be a prominent crop, it should only be cultivated as *one* of several products for exportation, and an ample sufficiency of everything consumed upon the farm should be grown at home. The idea that southern horses should be obtained from Kentucky, flour from Missouri, and part of the corn supply from Illinois, has been a curse to the cotton States. Specious and false was the theory of reciprocity of material interests; it never can be profitable to carry bulky agricultural products a thousand miles, to be used on soils as rich and cheap as any in the world, at an expense for transportation far exceeding the cost of production at the place of consumption. The variety of which this region is capable is truly wonderful; embracing all the cereals, grasses, vegetables, and fruits of the temperate zone, with many of the productions of the tropics. A belt extending from 25° to 39° north latitude, including a range of elevations amounting to 6,000 feet, and geological formations from the primitive granite to alluvion now in process of deposition, cannot become a wealthy region, rich by persistence in the culture of a single product.

Sugar production, though a special industry, must become, from the necessities of our people, as also from the adaptation of soil and climate to the growth of cane, a prominent, growing, and profitable interest, which should not be neglected. It promises at present to become, within three years, a business of greater magnitude than in 1860.

The Ramie, (*Bœhmeria tenacissima,*) a fibre of superior strength and beauty, is upon trial, and hopes are entertained that it may eventually add to the productive resources of this region.

The production of cotton-seed, castor and other oils should be largely extended.

The culture of grapes, peaches, olives, figs, oranges, lemons, bananas, and a great variety of other fruits of the semi-tropical and temperate climates is destined to afford pleasant and profitable occupation to a large number of people.

Rotation.—With variety of crops there may be system and recuperation in place of the present waste and exhaustion. Ruin follows continuous planting of hoed crops; the soil must be shaded with the luxuriance of green crops; grasses must be furnished to stock for supplies, both of meat and fertilizers. Heretofore,

as exhaustion was threatened, "rest" has been the remedy—such *rest* as attends the growing of weeds and broom sedge, filling the soil with seeds of pernicious growth and roots of tenacious grasses to plague the future cultivator.

The rotation should include but one year of cotton, with corn and peas and clover and other crops, varying the order and variety according to soil and other circumstances, the course extending four or five years, and so arranged as to cover the surface with green crops at least half the time. A correspondent says:

> The whole of eastern Virginia could be renovated in six years if farmers had energy and means to persevere in a proper system of rotation. Instead of two and three field shifts, they should adopt and adhere to a six-field rotation, somewhat as follows: First, corn; second, oats, seeded with clover; third, clover, pastured by sheep and hogs; Fourth, wheat, seeded with clover and orchard grass; fifth, hay; sixth, pasture.

Two years of clover to one each of corn and wheat, are suggested as a proper rotation by correspondents in western Carolina. Dr. Phillips, of the Southern Farmer, would place three-fourths of the land in pasture, grow roots and vegetables for stock, and three acres of corn for every one of cotton.

For feeding stock and fertilizing the soil, the cultivation of peas promises better than that of corn. Peas, sweet potatoes, and clover should occupy a prominent place in the rotation.

Improved culture.—In former years culture has been equivalent to careless scratching of the surface to the depth of two and a half inches, more or less. Deep thorough culture has proved as beneficial, in the few instances in which it has been practiced, as in other climates and soils. The case of David Dickson, of Georgia, is a representative one upon this point.

Horizontal culture and hill-side ditching are requisite on hilly lands. It is probable that uplands are deteriorated much more rapidly by washing than by the abstraction of the elements of crops. The best soils are of a texture so fine as to yield readily to the force of the surface currents, and the rains are so heavy that the utmost care only suffices to prevent destruction of the soil of hillsides.

Farm economy and improvement.—Winter shelters for stock should be provided. Barns for protection of farm animals, for economy in their management, and the preservation of farm products and implements, should be erected, with cellars adapted to the collection and preservation of manures. No farm is in its highest condition of efficiency without these improvements, and no climate sufficiently mild to dispense with them.

Fertilizers.—With "full garners, good pasture, and fat stock," as a correspondent suggests, there is no lack of abundant means of fertilization. To force a single crop, or to obtain a stand of clover or other resources for feeding animals or for green manuring, guano often gives marked and profitable results; in combination with other fertilizers, to supply a deficiency of ammonia, it is often highly advantageous; where more bulky manures, furnishing similar elements of fertilization, are difficult to obtain or expensive in transportation, it is sometimes admissible; but as a regular resource for the annual crop, the use of guano will ultimately impoverish the soil and its owner. Every farmer should rely mainly upon his stock for manures; hogs should be fattened upon field peas; cattle and horses should be penned at night in deeply littered yards. Accretions to the manure pile may be made from a great variety of sources, including all decaying vegetable and animal matter, waste and wash from the kitchen, muck from the swamps, and pine straw or leaves from the forest.

There are many special fertilizers in this section, ample for a perpetual supply of all possible drain upon the resources of the soil. The coast line from Virginia to Texas, including all the sounds, inlets, bays, and estuaries, has an aggregate extent of thousands of miles, and every mile can furnish abundant stores of fish and sea-weed for manuring adjacent fields. Oyster-shell lime is also plenty and cheap in the tide-water region.

No mineral manure is more abundant than marl, which is found in the whole tide-water section of the Atlantic coast, in the Mississippi valley, and in Texas. It underlies wide belts of various depths, often very near the surface; it is in many localities easily obtained in large quantities; and its value, though variable, is undoubted for application to soils needing lime. Gypsum can be obtained from native beds, at no great distance from any locality in the South. Lime is abundant in the mountain valleys, from Virginia to northern Alabama; and the "rotten limestone" formations of Alabama and Mississippi are unsurpassed for fertility.

All these home resources should be used in bringing up the average cotton yield from 190 to 500 pounds per acre, and obtaining, from half of the present acreage, all of the fibre needed, leaving free a sufficient area to produce the bread, the fruits and vegetables, the beef and mutton necessary for the home population, and a surplus of the lighter products for exportation.

Farm implements.—When half a million men were withdrawn from the agriculture of the northern States, by the exigencies of war, their place was supplied by farm implements and machinery. The scarcity of labor in the south, resulting from a like cause, must be remedied in the same way. It is probable, that of every $3,000 spent for farm labor, $1,000 at least might be saved by the introduction and effective use of the most approved labor-saving appliances. Corn has been cultivated, on certain prairie farms of large size, on which labor-saving machinery has wrought with the minimum of human aid, at a cost of scarcely more than a dollar per acre; and it is probable that southern crops will soon be cultivated at half the average cost of the past three years, in part through the economy of farm implements. Improved ploughs, cultivators, capable of cleaning daily greatly enlarged areas, steam engines for driving gins and threshing grain, and perhaps steam ploughs for breaking the soil, with many other forms of applied mechanical science, will ere long save annually $100,000,000 otherwise payable for animal or human muscle. This is the labor that is reliable, controllable, ever ready, never failing, and cheap withal. It is the labor that has given wealth to the north, and it is destined to perform an equal service for the south.

Miscellaneous desiderata.—One of the most essential needs of the South, attainable only with improvements already suggested and with the increase of population, is a better quality of roads and greater care in keeping them in good condition. A saving of transportation and breakage amounting to tens of millions annually would ensue from the accomplishment of this item of advancement.

An increase of laborers, especially of intelligent and skilled workers in every branch of agriculture and horticulture, are necessary to rapid progress. A portion of this increase should be obtained at home, and the remainder should be drawn by special inducements from other States and other countries.

Our correspondents very properly suggest, as aids to agricultural advancement, the dissemination of agricultural newspapers and books, the increase of schools, workshops, grist and saw-mills, manufactories, and railroad facilities.

A new career is opened to the South; a new system of agriculture is beginning to be adopted which promises, even while emerging from the chaos of abrupt change and the shock of grievous disappointment, to bless her people with a higher prosperity, within a single decade, than they have ever previously enjoyed.

METEOROLOGY OF 1867.

[Compiled from monthly reports made to the Smithsonian Institution through this department. The observations were made daily at the hours of 7 a. m. and 2 and 9 p. m., with slight occasional exceptions.]

Stations in States and Territories.	JANUARY.						FEBRUARY.					
	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
MAINE.		*Deg.*		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
Steuben	22	36	31	—12	17.0	3.75	14	47	20	— 1	25.2	3.67
Lee	......	......	......	......	......	......	3, 14	48	20	—14	21.8	3.40
Williamsburg	22	32	20, 30	—16	9.6	1.90	14	43	20	—11	19.8	3.30
West Waterville	22	37	20	—14	13.8	3.70	14	49	21	0	25.5	3.20
Gardiner	22	33	20	—17	13.1	2.62	14	49	21	3	25.9	4.36
Lisbon	......	......	20	—23	......	1.80	......	......	......	......	......	2.60
Webster	22	35	20	—19	13.2	......	14	49	21	2	25.5	......
Standish	22, 25	36	20, 31	—12	16.6	1.77	14	52	11	— 3	27.5	2.22
Rumford Point	......	......	......	......	......	......	24	51	21	— 8	24.7	2.40
Cornish	22	34	20	—10	14.1	2.50	1	48	11	— 1	26.6	2.98
Cornishville	22	34	30	— 8	14.9	3.20	14	50	11	1	26.8	3.15
Averages	......	......	......	......	14.0	2.66	......	......	......	......	24.9	3.13
NEW HAMPSHIRE.												
Portsmouth	22	40	31	— 8	21.3	2.97	14	58	11	9	32.4	2.31
Stratford	23, 26	28	16	—20	8.7	1.45	9	47	10	— 8	22.0	2.30
Tamworth	......	......	......	......	......	......	14	48	10, 11	— 1	26.5	......
North Barnstead	25	40	20	— 7	17.6	1.85	13	52	10	2	30.3	1.35
Concord	22	36	20, 31	—13	16.0	1.50	13, 14	52	11	4	32.0	......
Claremont	6	31	31	—15	12.6	1.85	14	52	11	0	29.0	4.04
Do	27	36	20	—18	12.5	......	......	......	......	......	......	......
Averages	......	......	......	......	14.8	1.92	......	......	......	......	28.2	2.50
VERMONT.												
Lunenburg	23	30	18	—20	9.3	2.05	4	48	11	—10	23.5	4.30
Craftsbury	6	27	16	—15	9.6	1.75	8, 13	45	10	— 5	22.2	2.35
Randolph	6	32	16	—22	9.9	1.63	9, 13	46	11	— 4	25.4	2.17
Middlebury	5, 6	32	16	—21	11.5	1.85	1, 9, 13	45	11	4	26.3	1.70
Brandon	6	34	16	—18	13.1	1.12	8	53	10	2	29.9	1.90
Barnet	22	30	19, 31	—20	7.7	1.00	8	50	21	15	34.8	4.50
Wilmington	25	31	16	—16	12.5	......	14	46	11	— 2	26.7	......
Averages	......	......	......	......	10.5	1.57	......	......	......	......	27.0	2.82
MASSACHUSETTS.												
Kingston	5	40	20	— 5	22.5	2.90	14	60	11	6	33.1	5.87
Topsfield	25	46	30	2	24.6	5.07	14	58	11	14	35.1	3.80
Lawrence	5	33	16	— 1	18.4	3.96	14	53	11	5	......	4.19
Georgetown	26	37	30	— 9	18.2	3.95	......	......	......	......	......	......
Newbury	5	41	31	— 6	18.2	......	14	56	11	5	31.5	......
Milton	25	39	20	— 7	19.1	3.60	13	53	11	8	31.7	......
North Billerica	5	42	30	—18	16.7	......	14	56	11	5	32.4	......
West Newton	......	......	......	......	......	......	14	59	11	4	34.8	4.34
New Bedford	21	41	19	— 2	22.4	2.72	14	57	11	10	35.0	4.97
Worcester	5	34	19, 20	0	19.1	5.16	14	53	10, 11	9	32.8	4.42
Mendon	5, 26	30	20	—13	16.3	3.00	14	51	11	4	31.5	......
Lunenburg	5	38	20	— 5	17.0	2.95	14	55	11	1	30.5	......
Amherst	24	34	16	— 5	18.3	1.34	14	50	11	8	31.2	3.65
Richmond	25	32	16	— 8	15.5	5.25	13	52	10	10	31.1	3.73
Williams College	5, 6	30	16	—16	14.1	1.65	13	50	10	2	28.8	2.35
Averages	......	......	......	......	18.6	3.46	......	......	......	......	32.3	4.15

Meteorology of 1867—Continued.

Stations in States and Territories.	JANUARY.						FEBRUARY.					
	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
RHODE ISLAND.		Deg.		Deg.	Deg.	In.		Deg.		Deg.	Deg.	In.
Newport	5	40	20	0	22.7	1.79	8, 19	50	11	12	33.8	5.58
CONNECTICUT.												
Pomfret	5	33	16, 19, 20	— 2	19.9	1.26	14	52	10	6	30.8	5.25
Columbia	23	36	20	—10	19.7	3.10	8, 9, 13	52	10	8	34.4	......
Middletown	24	37	20	— 9	19.6	2.41	14	58	10, 11	12	34.8	4.34
Colebrook	25, 26	32	30	— 9	14.0	......	14	52	10	7	31.8	......
Groton	5	39	20	— 1	23.2	3.27	14	54	11	14	35.2	4.90
Averages	......	......	......	......	19.3	2.51	......	......	......	......	33.4	4.83
NEW YORK.												
Moriches	5	48	20	—14	25.5	2.44	14	54	11	14	38.8	7.71
South Hartford	6	34	16	—22	14.6	1.41	13	52	11	2	30.5	2.85
Germantown	10	40	16	— 6	21.2	1.90	1, 14	49	11	10	33.6	4.20
Garrison's	26	38	16	0	18.4	2.35	14	55	10	11	......	5.44
Throg's Neck	5, 26	38	16	4	22.7	......	17	53	10, 11	14	35.4	......
White Plains	21, 26	36	16	1	22.5	......	14	56	11	13	35.6	......
Deaf & Dumb Inst.	26	37	29	4	23.2	2.54	14	53	10, 11	15	35.6	5.50
Columbia College	26	37	18, 30	8	22.6	2.34	14	51	11	15	34.6	3.54
St. Xavier's Coll	26	37	30	9	24.0	......	14	55	11	15	37.2	2.61
Flatbush	5	38	16, 20	5	23.0	0.70	17	57	11	13	36.3	1.74
Newburgh	24	42	16	— 6	21.1	2.13	1, 3, 4	50	23	16	35.2	3.39
Gouverneur	24	32	30	—25	11.5	1.21	13	50	10	— 2	24.7	2.62
North Hammond	26	31	16	—20	11.2	3.36	13	46	26	— 5	21.6	4.52
South Trenton	21	30	16	—18	13.9	2.35	13	50	10	0	29.2	6.49
Cazenovia	4	34	15	—15	15.7	......	28	47	11	6	29.6	6.10
Oneida	10	33	15, 16	—14	16.8	2.65	13	52	10	8	31.1	1.00
Houseville	5, 25	34	30	—16	12.3	1.53	9	54	10	1	27.3	3.66
Depauville	5	34	30	—13	14.3	2.08	8	48	10	4	26.4	3.74
Theresa	31	32	15	—17	......	2.00	......	......	......	......	......	1.90
Oswego	5, 10	32	16	— 4	19.1	4.26	13	48	10	7	30.0	3.32
Palermo	5	31	15	—15	14.6	4.70	8, 13	43	11	0	26.6	2.50
Baldwinsville	5	33	16	— 9	17.4	1.85	13	45	11	9	29.3	......
Skaneateles	1	39	15	— 4	18.8	7.10	28	50	11	9	31.3	......
Nichols	5	36	16	— 5	18.7	......	28	56	11	7	31.4	......
Geneva	5	36	15	5	19.3	1.30	8, 13	45	10	7	31.4	1.04
Rochester	4, 5	35	14, 19	8	20.9	2.68	28	49	11	8	30.6	3.01
Rochester Univ	31	37	15	1	18.8	2.68	8, 28	49	11	7	29.8	3.01
Little Genesee	31	44	30	—17	17.4	1.90	13	50	11	0	30.5	2.35
Friendship	31	45	15	— 6	16.0	......	28	53	10	6	30.0	......
Buffalo	5	37	19	2	20.3	2.42	8	56	10	7	32.1	2.61
Averages	......	......	......	......	18.5	2.50	......	......	......	......	31.3	3.54
NEW JERSEY.												
Paterson	1, 6, 24, 26	36	30	— 1	21.4	1.86	14	58	11	10	34.6	6.41
Newark	26	39	20	1	22.7	1.61	14	55	23	16	37.7	5.64
New Brunswick	6	36	16, 20, 30	2	21.1	0.64	14	51	23	13	35.1	......
Trenton	6	40	30	9	26.7	1.55	14	52	10, 11	20	39.4	6.08
Burlington	5, 6	40	16, 20, 30	4	21.9	1.59	14, 17	54	11	16	38.6	4.00
Moorestown	5	44	16	— 1	22.2	1.13	13	57	11	14	37.2	3.62
Mt. Holly	6	41	16	4	23.8	1.60	13	56	11	17	38.5	......
Seaville	10	40	29	6	26.6	2.53	......	......	......	......	......	......
Dover	26	39	20	— 5	21.9	1.90	14	59	23	12	35.8	4.79
Readington	24, 26	38	20	0	21.7	2.08	17	50	23	9	34.4	5.28
Haddonfield	6	37	16	5	21.7	2.10	13, 14	55	11	15	37.8	3.70
Greenwich	31	38	16	— 1	23.8	1.74	16	62	11	15	39.5	3.62
Averages	......	......	......	......	23.0	1.69	......	......	......	......	37.1	4.79
PENNSYLVANIA.												
Nyces	4	43	20	—16	15.4	1.70	7	57	11	2	30.9	4.60
Fallsington	26	43	16	1	23.7	1.70	17, 18	52	11	17	38.3	3.90
Philadelphia	5	41	30	11	26.3	1.93	13, 14, 28	54	11	20	40.0	4.82

Meteorology of 1867—Continued.

Stations in States and Territories.	JANUARY. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	FEBRUARY. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
PENN'A—Contin'd.		*Deg.*		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
Germantown	6, 12, 31	38	30	4	23.8	3.60	14	57	11	13	38.1	......
Horsham	6	39	30	3	21.7	1.10	28	53	11	14	36.2	1.95
Dyberry	4	43	16	—17	15.6	1.80	28	51	11	1	29.3	......
Whitehall	6	38	16	— 3	21.2	1.43	24	50	11	10	34.6	......
Parkesville	5, 26	34	16	— 6	21.6	1.32	17	52	11	14	36.6	3.50
Stevensville	5	38	16	—10	19.1	1.53	28	54	11	7	32.9	1.96
Reading	26	39	3, 20, 30	7	24.4	......	13	54	11	16	37.2	......
Ephrata	5, 26	36	16	— 2	22.1	1.72	17	56	11	12	38.1	4.28
Silver Spring	5	38	3	0	23.0	1.33	....	....	....	......	......	......
Mount Joy	24	45	16	3	25.9	1.10	17	64	11	15	37.5	4.65
Harrisburg	5, 6	36	20, 30	10	23.7	2.09	17	50	11	16	35.3	4.22
Lewisburg	6	34	3, 16	—13	17.8	1.61	17, 18	49	11	4	31.7	4.10
T oga	5	40	30	—18	17.8	1.05	28	60	11	0	32.7	2.55
Fleming	4	35	30	—16	18.9	2.23	1, 13	48	11	2	31.9	3.46
Grampian Hills	4	32	30	—14	16.1	2.73	28	54	11	— 6	30.6	3.46
Murrysville	25	37	30	—16	18.6	2.70	....	....	....	......	......	......
Connellsville	31	55	30	—10	19.3	......	13	61	10	— 2	37.8	......
New Castle	31	43	30	—16	20.2	......	28	53	10, 11	5	34.9	......
Canonsburg	31	47	30	—20	18.2	0.97	8	62	11	— 7	34.7	2.86
Averages	....	....	....	......	20.6	1.77	....	....	....	......	35.0	3.59
DELAWARE.												
Delaware City	5, 6, 9, 26, 31	38	16	2	24.3	......	17	54	11	16	37.5	......
MARYLAND.												
Woodlawn	3	36	40	3	24.2	1.00	17	58	11	13	38.3	3.85
Catonsville	26	39	30	5	23.8	1.25	14	60	10	7	36.7	......
Annapolis	9	46	3	2	30.1	1.32	1, 14	58	11	12	41.6	5.44
St. Inigoes	5, 31	43	30	10	27.4	1.12	....	....	....	......	......	......
Emmittsburg	24	42	30	— 2	22.3	1.53	17	54	11	7	35.0	......
Averages	....	....	....	......	25.6	1.24	....	....	....	......	37.9	4.65
VIRGINIA.												
Lynchburg	31	44	19	16	32.8	0.80	....	....	....	......	......	......
WEST VIRGINIA.												
Romney	4	56	17, 24, 30	0	21.7	......	....	....	....	......	......	......
Grafton	31	52	30	—10	24.4	2.40	18	62	10, 11	5	42.2	7.00
Cabell C. H	31	58	19	5	27.6	1.50	16	64	10	6	42.2	6.10
Weston	31	55	30	— 8	24.4	......	....	....	....	......	......	......
Averages	....	....	....	......	24.5	1.95	....	....	....	......	42.2	6.55
NORTH CAROLINA.												
Goldsboro	31	61	18	15	37.0	5.02	24	85	11	21	53.3	0.62
Oxford	31	50	18	15	30.8	2.69	24	73	11	19	46.8	3.30
Raleigh	31	58	5	12	31.6	......	24	79	11	17	48.4	2.44
Albemarle	14	58	19	10	33.1	3.33	15, 20	77	10, 11	16	48.5	2.83
Statesville	31	55	4	6	29.0	1.96	15, 20	70	11	12	44.7	3.00
Averages	....	....	....	......	32.3	3.25	....	....	....	......	48.3	2.44
SOUTH CAROLINA.												
Aiken	14	73	18	21	40.8	2.36	24, 26	78	10	22	54.7	2.84
GEORGIA.												
Atlanta	14	68	18	10	35.9	1.70	25	81	10	11	49.2	1.47

Meteorology of 1867—Continued.

Stations in States and Territories.	JANUARY.						FEBRUARY.					
	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
ALABAMA.		*Deg.*		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
Moulton	31	69	18	18	38.4	0.26	24	72	10	19	51.9	1.00
Carlowville	13, 14	75	27	26	45.2	1.88	25	80	10	24	56.7	3.39
Fish River	12, 23	70	11	30	50.9	0.90	24	76	10	27	56.0	1.15
Prairie Bluff	......	......	......	......	......	......	25	82	10	25	58.8	......
Uniontown	13	78	28	24	44.6	......	......	......	......	......	......	......
Green Springs	13	78	18	21	43.2	1.70	25	81	10	19	54.8	1.38
Averages	......	......	......	......	44.5	1.19	......	......	......	......	55.6	1.75
FLORIDA.												
Jacksonville	13	79	18, 19	32	52.1	4.62	25	86	10	32	62.6	4.95
Port Orange	14	82	19	40	56.9	......	25	79	10	38	64.0	......
Gordon	13	73	10	28	51.0	......	20, 26	80	10	29	62.2	......
Fernandina	13	76	19, 27	28	48.3	......	21, 26	79	10	27	56.7	......
Averages	......	......	......	......	52.1	4.62	......	......	......	......	61.4	4.95
TEXAS.												
Chapel Hill	13, 22, 23	78	1, 2	20	53.7	0.75	24	79	9	34	65.2	0.00
Austin	24	78	2, 3	17	51.1	0.00	3	84	10	25	58.4	0.72
Averages	......	......	......	......	52.4	0.38	......	......	......	......	61.8	0.36
MISSISSIPPI.												
Fayette	13, 14	74	2	22	45.4	......	24	80	9, 10	24	56.2	......
Natchez	14	80	2	22	49.2	1.97	18	83	10	24	54.4	1.95
Kingston	13, 14	77	2	26	50.0	0.75	24	80	9	32	60.4	3.50
Averages	......	......	......	......	48.2	1.36	......	......	......	......	57.0	2.73
ARKANSAS.												
Helena	13	77	2	16	40.4	3.71	......	......	......	......	......	......
Fort Smith	31	71	3	3	37.2	......	13, 23, 28	72	9	17	45.5	......
Averages	......	......	......	......	38.8	3.71	......	......	......	......	45.5	......
TENNESSEE.												
Tusculum College	25	56	2, 17, 18	10	30.1	......	15	71	10	12	44.5	......
Lookout Mountain	31	57	18	3	33.4	......	25	73	9	11	49.2	......
Clarksville	31	62	18	4	31.7	1.61	15	69	10	— 4	45.3	8.99
Averages	......	......	......	......	31.7	1.61	......	......	......	......	46.3	8.99
KENTUCKY.												
Chilesburg	31	55	18	6	26.6	3.19	15	66	10	2	42.2	9.60
Louisville	31	57	22	2	26.6	2.93	18	63	10	—11	42.7	8.90
Danville	31	60	2, 17, 28	10	29.7	2.73	18, 23	65	10	— 2	42.4	7.96
Lexington	31	57	17	0	28.7	2.76	15	66	10	— 1	33.0	9.22
Averages	......	......	......	......	27.9	2.90	......	......	......	......	40.0	8.92
OHIO.												
New Lisbon	31	47	30	—18	20.3	3.59	28	60	10	— 1	35.6	2.70
East Fairfield	31	41	30	— 8	18.8	2.00	18	53	10, 11	4	34.4	2.43
Steubenville	31	45	30	— 8	22.0	......	16	55	10	5	39.0	......
Martin's Ferry	15	48	30	—13	19.5	......	28	58	11	0	36.9	......
Painesville	31	44	30	3	19.8	4.40	28	54	10	4	32.3	......
Milnersville	31	46	30	—20	18.3	2.10	28	62	11	— 1	30.3	1.86
Cleveland	31	46	30	— 4	20.2	......	18	60	10	4	35.2	......
Do.	31	49	30	— 5	20.7	2.34	18	60	10	3	34.6	3.15
Wooster	25	38	30	—24	18.3	......	18	58	10	— 1	35.3	......
Gallipolis	31	56	30	0	23.6	1.92	23	63	10	0	41.6	4.98

Meteorology of 1867—Continued.

Stations in States and Territories.	JANUARY. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	FEBRUARY. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
OHIO—Continued.		*Deg.*		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
Kelley's Island	31	44	30	— 2	20.7	1.46	28	52	10	3	32.8	3.42
Norwalk	31	48	30	—12	19.8	1.64	28	60	10	0	34.4	3.30
North Fairfield	......	......	......	......	......	......	18	56	10	— 3	34.4	4.05
Westerville	31	49	30	—17	21.0	1.60	28	58	10	— 2	37.0	1.68
Kingston	31	49	30	—12	20.4	2.12	18	63	10	— 4	38.5	3.67
Toledo	31	46	19, 30	— 6	19.6	1.50	27	62	10	2	33.3	3.13
Marion	31	42	30	—17	17.2	2.35	18	53	10	— 4	33.4	4.07
Kenton	31	55	29	5	31.4	3.50	1	60	10	10	39.5	6.50
Bowling Green	......	......	......	......	......	......	18	54	10	0	32.8	5.46
Urbana University	31	46	30	—15	17.9	1.60	13	58	10	—10	34.4	3.85
Hillsboro'	31	50	17	— 4	20.7	1.94	18	60	10	— 4	38.1	4.54
Ripley	31	59	19, 30	4	25.6	2.62	......	......	......	......	......	......
Lafayette	31	49	30	—14	20.2	4.60	28	58	10	— 4	33.5	5.60
Bethel	31	51	30	— 4	20.0	2.75	14	57	10	— 7	35.5	2.38
Cincinnati	31	50	17	4	27.3	1.27	13, 23	59	10	— 2	39.7	3.56
Do	31	52	17	— 5	22.6	2.50	16, 23	64	10	2	43.8	5.32
College Hill	31	52	17	— 5	22.6	2.50	14	60	10	— 7	38.8	2.75
Farm School	31	54	17	— 2	22.2	2.90	18	58	10	— 4	37.3	3.95
Averages	......	......	......	......	20.8	2.42	......	......	......	......	36.0	3.74
MICHIGAN.												
Monroe City	31	48	30	— 8	21.1	2.50	28	54	10	0	31.9	2.30
Alpena	5, 31	35	29	2	19.5	2.30	7	37	10	2	25.6	1.56
State Ag. College	31	46	30	—15	17.6	1.68	8	53	10	— 2	30.9	3.63
Litchfield	31	44	12	—10	16.3	1.13	28	56	10	— 2	30.0	4.85
Grand Rapids	31	42	12	—12	14.9	2.54	7, 18, 27	50	10	— 3	29.5	......
Kalamazoo	6	38	2	4	21.9	......	28	48	10	9	28.9	......
Northport	4, 31	32	19	— 4	19.5	......	7	52	24	4	26.7	......
Holland	31	43	15	— 4	22.7	3.90	7	57	10	4	31.8	2.12
Ontonagon	3	32	29	—10	13.8	2.00	7, 27, 28	40	10	—22	15.1	......
Homestead	31	37	19	— 8	19.4	......	7	52	25	— 8	27.7	......
Averages	......	......	......	......	18.7	2.29	......	......	......	......	27.8	2.89
INDIANA.												
Richmond	31	44	30	—13	17.4	2.53	18	57	10	—11	34.2	5.09
Aurora	31	53	17	— 6	21.6	1.82	23	62	10	— 8	36.5	5.64
Vevay	31	57	29, 30	0	24.7	6.18	8, 13, 14	62	10	—10	41.7	7.34
Muncie	31	47	30	—11	19.3	2.45	23	59	10	— 8	34.9	5.15
Spiceland	31	47	17	—11	19.7	2.50	18	58	10	— 8	35.2	3.40
New Albany	31	55	17	0	26.0	2.30	15, 23	64	10	— 6	40.5	8.70
Columbia City	31	49	30	—16	19.3	1.00	28	58	10	— 6	33.2	2.90
Indianapolis	31	50	29	—10	21.6	......	18	60	10	— 4	39.3	......
Rensselaer	31	43	17	—16	16.1	3.30	28	60	10	—15	28.8	5.50
Merom	31	48	18	— 5	21.9	2.80	13, 18	57	10	— 2	36.8	4.25
New Harmony	31	55	22	— 2	26.3	2.59	15	66	10	— 1	41.4	7.15
Averages	......	......	......	......	21.4	2.75	......	......	......	......	36.6	5.51
ILLINOIS.												
Evanston	31	40	17, 29	—14	16.0	......	13	45	10	—13	......	......
Chicago	31	42	17	—18	20.3	1.92	28	57	10	— 6	32.0	2.23
Near Chicago	......	......	......	......	......	......	28	58	10	—17	30.4	......
Riley	31	38	29	—28	12.9	2.50	28	53	10	—24	24.3	3.94
Golconda	16, 31	61	23	— 8	27.2	1.90	12	71	10	0	43.9	6.20
Aurora	31	41	17	—18	14.8	2.45	28	51	10	—20	26.5	3.30
Sandwich	31	43	29	—20	14.6	2.20	28	51	10	—17	26.7	5.85
Ottawa	31	44	29	—10	23.2	1.28	28	62	9	— 5	32.2	4.00
Winnebago	31	41	17	—22	12.9	2.86	28	49	10	—22	23.6	2.83
Dixon	......	......	......	......	......	......	28	60	10	—18	26.2	......
Magnolia	31	50	17	—16	16.7	3.00	28	73	10	—13	29.0	4.08
Rochelle	31	44	29	—21	15.9	......	28	54	10	—20	27.0	......
Wyanet	31	40	29	—17	17.3	1.48	28	64	9, 10	—10	29.5	2.53
Tiskilwa	31	45	17, 29	—12	19.6	1.10	28	58	10	— 9	23.9	......
Elmira	31	46	17	—14	18.3	0.75	28	60	9	—12	30.0	2.20

Meteorology of 1867—Continued.

Stations in States and Territories.	JANUARY. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	FEBRUARY. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
ILLINOIS—Cont'd.		Deg.		Deg.	Deg.	In.		Deg.		Deg.	Deg.	In.
Peoria	31	45	29	—10	19.6	1.36	28	59	10	— 7	31.9	2.88
Springfield	6	46	17, 28	— 4	19.8	......	13	54	10	— 3	32.4	......
Loami	31	52	17	— 9	20.1	2.70	13	61	10	— 6	33.3	5.00
Waterloo	6	54	18	— 2	25.4	......	15	64	10	— 3	34.9	......
Dubois	......	......	......	......	......	......	15	62	10	0	37.2	6.27
Galesburg	31	48	17	—10	16.7	0.45	28	62	10	—11	29.2	2.56
Manchester	31	56	28	— 4	20.9	1.60	27	61	9	— 4	34.8	6.34
Mount Sterling	31	62	17	— 6	21.3	1.45	28	62	9	— 8	33.9	......
Andalusia	31	48	21	1	20.5	......	28	62	10	—10	30.6	......
Augusta	31	54	17	— 6	20.7	1.85	28	64	9	— 7	33.2	2.53
Averages	......	......	......	......	19.3	1.81	......	......	......	......	26.5	3.92
WISCONSIN.												
Manitowoc	31	35	17	—15	17.4	1.65	11	41	10	—10	26.2	1.75
Plymouth	31	35	17	—20	14.5	2.70	28	50	10	—15	25.0	1.80
Milwaukee	5, 31	42	17	—16	17.5	2.61	7	47	10	—11	27.4	2.13
Do	31	39	17	—14	18.8	2.05	27	48	10	—12	28.4	2.22
Delavan	31	40	17, 29	—23	13.6	1.75	28	50	10	—18	24.7	2.49
Waupacca	3	35	17	—18	18.2	2.40	7, 27	50	9	—10	24.7	......
Embarrass	4, 20	28	17	—18	12.3	2.39	7, 27	45	10	—18	23.6	3.10
Rocky Run	31	37	17, 29	—18	16.5	2.00	28	51	10	—14	24.7	1.93
Beloit	31	37	29	—19	14.2	2.67	28	44	10	—16	23.9	3.80
Baraboo	31	39	29	—15	18.9	5.21	28	52	10	—12	26.8	4.44
Bayfield	3, 12, 31	30	29	—12	14.3	......	5	42	10	—20	17.5	2.10
Averages	......	......	......	......	16.0	2.54	......	......	......	......	24.8	2.58
MINNESOTA.												
Beaver Bay	31	28	29	—18	9.7	11.91	4	36	10	—28	12.5	0.00
Red Wing	3, 7	33	29	—27	9.4	3.03	27	51	9	—19	18.5	1.20
Afton	3	34	29	—25	8.0	......	27	44	10	—23	15.2	......
St. Paul	3	31	17, 29	—27	8.1	0.97	7, 27, 28	41	10	—24	16.2	1.12
Do	3	39	17, 29	—22	9.6	1.20	......	......	......	......	......	......
Minneapolis	3	38	29	—32	8.3	1.66	7, 27	44	24	—30	14.1	1.03
Sibley	3	37	17	—31	8.1	0.85	27	43	9	—31	13.4	0.70
New Ulm	3	40	17	—22	10.5	0.84	12	43	9	—20	15.3	1.28
Averages	......	......	......	......	9.0	2.92	......	......	......	......	15.0	0.89
IOWA.												
Clinton	31	40	29	—20	17.9	2.50	28	50	10	—15	28.2	4.00
Lyons	7, 31	36	29	—24	15.6	1.25	28	54	10	—20	24.9	3.02
Davenport	31	42	29	—15	15.0	0.25	28	53	9	—13	26.1	5.77
Dubuque	31	42	29	—20	15.4	2.63	28	52	9	—12	25.1	4.45
Muscatine	31	47	29	—14	16.0	0.75	28	57	10	—14	25.5	3.62
Atalissa	......	......	......	......	......	......	28	53	9, 10	— 9	25.5	3.25
Monticello	7, 31	40	29	—22	17.8	1.25	28	50	10	—15	28.8	3.46
Fort Madison	31	50	29	—10	18.9	0.90	12, 28	59	9, 10	—11	30.8	3.08
Guttenberg	31	40	29	—30	11.4	1.30	7, 27, 28	52	10	—24	22.3	......
Ceres	31	40	17	—20	14.4	......	28	52	9	—11	24.8	......
Mount Vernon	31	44	29	—20	14.8	......	28	60	10	—18	24.4	......
Iowa City	31	45	29	—18	17.9	1.26	28	68	10	—18	26.3	7.46
Independence	31	40	29	—20	14.2	1.20	28	50	9	—18	23.3	......
Near Independence	31	40	29	—26	9.6	1.60	28	54	10	—23	20.8	3.60
Waterloo	4, 31	40	29	—16	14.0	......	17, 28	44	9	—14	22.7	......
Osage	4	31	17	—23	9.1	3.23	13	40	10, 11	—21	18.3	2.00
Iowa Falls	4	36	17	—18	13.3	1.40	7	48	9	—17	21.0	5.99
Des Moines	3	46	28	—11	15.1	1.55	27	54	9	—16	25.2	2.13
Algona	3	37	17	—22	8.2	1.70	12, 27, 28	40	9	—26	14.7	......
Fontanelle	31	38	27	—10	14.0	1.65	27	52	9	—16	24.4	3.30
Harris Grove	31	39	27	—10	15.5	2.70	27, 28	48	9	—16	23.4	3.80
Fort Dodge	31	36	17	—16	11.0	......	27	47	9	—19	20.5	......
Averages	......	......	......	......	14.2	1.60	......	......	......	......	24.0	3.93

Meteorology of 1867—Continued.

Stations in States and Territories.	JANUARY.						FEBRUARY.					
	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
MISSOURI.		*Deg.*		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
St. Louis	31	58	18, 28	5	25.6	2.29	......	......	......	......	......	......
St. Louis Univer'y	31	59	17, 18	5	26.3	2.02	13	67	10	7	40.2	3.43
Allenton	31	61	2	-7	22.0	2.66	13	72	10	-1	38.1	3.48
Union	31	61	2, 21, 22	0	25.4	1.45	13	67	9	1	38.0	2.18
Canton	......	......	......	......	......	......	28	65	9, 10	-8	32.2	3.40
Edinburg	31	55	27	-7	17.3	......	......	......	......	......	......	......
Rolla	31	62	21	-8	29.3	1.92	23	70	10	-4	37.5	3.70
Harrisonville	31	62	1, 2	-6	22.9	1.88	7, 17	56	9	4	34.7	6.58
Oregon	6, 15, 31	45	1	-3	20.9	2.08	11, 12, 27, 28	55	9	-3	32.1	4.89
Averages	......	......	......	......	23.7	2.04	......	......	......	......	36.1	3.95
KANSAS.												
Leavenworth	31	56	1	-10	20.1	1.93	28	64	9	-2	32.5	3.46
Olatha	31	60	1	-8	21.4	......	28	64	9, 21	0	33.3	3.40
Atchison	31	48	1, 27	-6	20.7	1.90	28	66	9, 21	-3	31.2	12.10
LeRoy	31	67	2	-7	23.9	1.40	7, 17, 28	62	21	1	36.5	3.18
Burlingame	12	56	27	-8	......	0.50	......	......	......	......	......	......
State Ag. College	15	47	27	-12	22.5	0.63	7, 27	57	21	-2	32.3	3.01
Council Grove	15	48	27	-12	24.0	0.70	28	59	21	-3	33.7	5.50
Averages	......	......	......	......	22.1	1.18	......	......	......	......	33.3	5.11
NEBRASKA.												
Elkhorn	31	36	27	-10	14.6	2.28	28	50	9, 21, 24	-12	20.2	1.05
Bellevue	31	40	1	-2	18.5	1.80	27	53	21	-7	26.7	2.44
Glendale	31	37	27	-10	14.5	1.84	27	52	9, 21	-10	22.9	2.70
Averages	......	......	......	......	15.9	1.97	......	......	......	......	23.3	2.06
UTAH TERRITORY.												
Gt. Salt Lake City	......	......	......	......	......	......	27	55	7, 24	15	32.9	1.62
Wanship	......	......	......	......	......	......	26, 27	46	14	0	25.6	......
Averages	......	......	......	......	......	......	......	......	......	......	29.3	1.62
CALIFORNIA.												
San Francisco	18	59	13	41	49.5	8.35	3, 10	55	23	39	47.6	9.68
Sacramento	20	60	25	35	48.2	3.44	26	60	15	36	49.0	7.10
Elk Grove	7, 20, 21	60	25	36	49.4	4.75	10, 11	61	17	36	49.4	6.00
Monterey	28	63	14, 15	36	50.8	3.61	5, 26	63	9, 23	34	32.9	4.23
Averages	......	......	......	......	49.5	5.04	......	......	......	......	44.7	6.73
OREGON.												
Albany	27, 31	58	9	25	41.5	14.45	2	53	14	25	38.6	10.70
Corvallis	27, 28, 29	56	6, 7, 9	28	......	......	1, 8	50	14	28	......	......
MONTANA TER.												
Helena City	17, 28	45	23	-16	17.9	1.40	9, 26	45	20	-23	18.0	0.60

Meteorology of 1867—Continued.

Stations in States and Territories.	March.						April.					
	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
MAINE.		Deg.		Deg.	Deg.	In.		Deg.		Deg.	Deg.	In.
Steuben	31	48	3	5	26.5	5.18	16	59	13	26	38.8	5.66
Lee	31	51	16	— 5	22.0	5.30	......	......	......	......	......	......
Prospect	13	57	15	6	31.1	2.19	29	60	14	26	41.0	......
Williamsburg	31	47	15	— 3	22.9	3.85	16, 26	52	14	19	35.7	4.30
West Waterville	31	52	16	— 2	28.0	4.55	20	67	13	29	41.4	3.42
Gardiner	31	50	16	— 2	26.6	5.76	16, 21	56	13	28	41.0	4.96
Webster	31	50	16	— 1	26.2	......	16, 21	58	13	27	39.9	......
Standish	31	53	16	— 1	27.8	3.86	21	62	14	28	41.5	4.53
Rumford Point	31	51	16	— 2	27.0	3.00	16	65	12	21	39.8	3.80
Cornish	31	52	3	4	27.3	3.40	15, 20	60	14	24	40.4	4.34
Cornishville	31	46	3	4	26.6	3.57	16, 20, 23, 26	57	13	27	40.5	3.98
Averages	......	......	......	......	26.5	4.07	......	......	......	......	40.0	4.37
NEW HAMPSHIRE.												
Portsmouth	31	54	15	10	32.0	2.63	25	63	14	30	46.2	5.31
Stratford	31	47	3	— 5	24.0	3.52	20	59	14	16	36.4	4.07
North Barnstead	31	52	15	11	29.0	2.62	15, 19, 26,	64	27	30	43.6	3.95
Concord	3	53	3	11	30.6	......	15	65	6	28	43.5	3.75
Claremont	31	58	20	4	29.0	2.53	15, 16, 26, 27	60	14	24	43.4	3.91
Averages	......	......	......	......	28.9	2.83	......	......	......	......	42.6	4.20
VERMONT.												
Lunenburg	29, 31	48	2	0	24.7	2.60	......	......	......	......	......	......
Craftsbury	31	46	3	— 4	24.6	2.20	20	58	13, 14	25	35.9	......
Randolph	31	52	15	— 2	26.7	1.85	15, 26	60	14	19	39.3	4.17
Middlebury	31	54	3	2	28.4	2.68	26	67	13, 14	23	41.5	4.51
Brandon	31	62	3	6	29.3	1.64	15	65	13	28	43.2	4.36
Barnet	31	58	1	15	34.3	2.70	......	......	......	......	......	......
Averages	......	......	......	......	28.0	2.28	......	......	......	......	40.0	4.35
MASSACHUSETTS.												
Kingston	31	55	15	13	31.0	4.75	30	70	14	25	43.4	2.00
Topsfield	31	56	15	19	36.4	4.28	15	66	13	34	49.0	2.15
Lawrence	31	51	14	9	30.0	4.13	15	67	14	31	44.5	2.81
Georgetown	13, 14	55	11	6	32.4	......	......	......	......	......	......	......
Newbury	31	59	15	10	31.7	......	15, 30	68	14	27	44.5	......
North Billerica	11	53	15	10	31.2	......	15	69	14	30	......	......
West Newton	2, 31	56	15	10	32.5	......	15	76	29	26	41.1	......
New Bedford (R.)	31	58	3, 15	18	33.5	5.31	21	65	13, 28	33	45.7	3.48
New Bedford (T.)	31	59	15	18	34.3	6.08	21	66	13	32	47.1	3.04
Worcester	31	52	15	13	31.9	4.40	15	69	14, 24	30	46.5	2.56
Mendon	31	51	15	9	29.1	......	15	67	14, 28	32	44.3	......
Lunenburg	24	53	15	7	30.7	2.59	15	65	14	29	44.6	2.10
Amherst	31	53	15	11	30.8	3.14	15	66	14	29	45.5	3.79
Richmond	31	52	15	8	31.3	6.25	8	64	3, 7, 21, 29	30	44.6	7.59
Williams College	31	51	3	10	30.1	1.38	15	68	13, 14, 28	32	44.6	3.96
Averages	......	......	......	......	31.8	4.23	......	......	......	......	44.1	3.35
RHODE ISLAND.												
Newport	31	52	15	14	32.9	6.47	19, 26	68	14	30	44.0	2.34
CONNECTICUT.												
Pomfret	31	53	15	11	29.9	2.51	15	67	14	29	44.2	2.26
Groton	4	54	15, 19	18	34.0	4.19	......	......	......	......	......	2.39
Columbia	2	50	15	16	31.9	......	8, 13, 15, 21	64	28, 29	32	46.5	......
Middletown	31	65	15	15	33.4	3.51	8	69	14	33	49.2	2.44
Colebrook	24, 31	53	15	14	26.9	......	15	69	28	28	44.1	......
Averages	......	......	......	......	31.2	3.40	......	......	......	......	46.0	2.36

Meteorology of 1867—Continued.

Stations in States and Territories.	MARCH.						APRIL.					
	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
NEW YORK.												
		Deg.		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
Moriches	31	69	19	15	38.3	5.35	19	70	12	36	50.9	1.33
South Hartford	11, 31	58	19	5	31.4	1.95	26	67	14	30	47.7	4.39
Troy	......	......	......	......	......	......	15	68	13	33	45.9	3.21
Germantown	31	63	3	13	32.8	6.40	15	72	14, 28	34	48.5	6.90
Garrison's	31	60	15	15	34.0	2.59	15	71	28	33	48.0	3.14
Throg's Neck	31	66	15	17	34.9	......	13	74	28	38	49.8	......
White Plains	31	61	15	16	33.7	......	15	70	28	35	48.9	......
Deaf & Dumb Inst.	31	58	15	16	34.3	4.09	15	68	3	37	48.8	2.47
Columbia College	31	59	15	17	33.7	3.29	15	71	27	38	49.8	1.96
St. Xavier's College	31	62	15	19	35.5	3.45	15	66	28	38	50.4	2.85
Flatbush	31	62	15	15	34.1	2.12	8	65	9	33	49.5	2.94
Newburgh	31	62	19	17	33.7	2.11	15	74	6	36	50.7	1.49
Gouverneur	24	57	3, 8, 19	0	25.9	1.49	15	70	13	27	42.3	4.42
North Hammond	28	48	3	−4	25.1	1.56	15	68	6	24	41.3	5.60
Houseville	22, 23	52	3	1	27.3	2.11	15	67	6, 11	26	41.2	5.78
South Trenton	1, 6, 23	40	3, 20	4	25.6	5.30	15	70	3	26	40.3	6.09
Cazenovia	31	52	3	3	29.2	1.63	15	72	6, 11	28	43.2	5.69
Oneida	......	......	......	......	......	......	15	70	6	31	44.4	7.39
Depauville	23	46	3	5	28.7	3.24	15	68	6	28	42.1	3.95
Oswego	1	46	3	9	31.2	2.65	15, 20	69	28	29	42.1	3.62
Palermo	31	48	3	5	26.7	2.95	......	......	......	......	......	......
Baldwinsville	31	45	3	11	29.6	1.90	16	62	6	28	42.4	......
Skaneateles	31	52	18	11	30.6	......	19	68	27	28	44.7	......
Nichols	31	59	18, 19	10	32.0	......	15	72	28	29	46.4	......
Geneva	1, 31	48	14, 18	12	30.7	0.66	4	73	28	26	44.4	3.91
Rochester	1	53	15	10	29.5	2.08	14	73	27	29	44.0	2.93
Rochester Univ'ty.	1	53	15, 18, 19	10	29.4	2.08	15	71	6	29	43.7	2.93
Little Genesee	31	61	19	−1	31.6	1.70	4	72	3	24	45.3	1.95
Friendship	31	55	19	4	28.7	......	......	......	......	......	......	......
Buffalo	1	55	14	9	30.6	4.68	14	74	6	29	42.9	3.51
Averages	......	......	......	......	31.0	2.21	......	......	......	......	45.7	3.82
NEW JERSEY.												
Paterson	31	63	15	12	34.7	5.71	15	75	12	35	50.9	2.78
Newark	31	64	19	15	34.0	4.40	15	74	28	33	50.6	2.58
New Brunswick	31	59	18, 19	15	34.1	2.38	22	78	3	36	49.4	1.99
Trenton	31	60	18, 19	22	38.4	7.22	22	74	3, 24	40	55.5	0.93
Burlington	31	62	19	17	36.7	3.80	22	82	3, 6, 7, 24, 28, 29	40	53.0	1.85
Moorestown	31	64	15	18	35.6	4.10	22	81	28	37	51.3	1.41
Mt. Holly	31	61	19	16	36.5	......	22	78	12, 28, 29	39	52.0	......
Seaville	31	52	15	20	38.1	19.10	22	69	28	32	53.6	7.90
Dover	31	60	15, 18	17	35.1	2.70	13	75	30	35	50.3	2.80
Readington	31	58	20	12	34.0	2.98	22	76	4	33	52.7	......
Haddonfield	31	63	18, 19	18	35.5	4.85	22	79	28	36	51.5	1.76
Greenwich	31	61	19	19	37.7	7.47	22	82	28	38	53.5	0.95
Averages	......	......	......	......	35.9	5.88	......	......	......	......	52.0	2.50
PENNSYLVANIA.												
Nyces	31	59	15, 20	4	29.2	3.10	15	69	3	28	44.6	3.32
Fallsington	31	64	19	13	39.5	4.40	22	78	5	37	52.0	1.20
Philadelphia	31	60	15, 18	22	37.6	5.67	22	80	3, 28	39	53.2	1.36
Germantown	11	58	18	14	34.1	......	......	......	......	......	......	......
Horsham	31	63	19	18	34.8	3.94	22	79	3, 29	38	50.9	1.38
Dyberry	31	60	20	2	28.8	......	4	70	12	26	43.6	......
Whitehall	31	59	19	10	34.7	......	22	80	2, 7	28	49.5	......
Parkesville	2	56	19	10	35.3	5.00	22	76	7, 28	36	51.6	2.36
Reading	31	61	18	17	36.8	......	22	78	28	37	53.3	......
Ephrata	31	62	15	18	36.7	6.14	15, 16	76	24	38	54.2	2.16
Mount Joy	31	61	19	14	37.3	3.70	22	85	28	36	53.4	0.53
Harrisburg	31	56	18	19	35.7	5.21	22	75	24	37	53.9	2.01
Tioga	31	64	19	2	31.6	2.05	15	76	3, 27, 28	26	49.2	4.48
Fleming	31	57	19	4	32.0	3.04	4	72	3, 5	27	46.8	4.28
Lewisburg	31	63	18	11	33.5	2.45	15	73	24	32	49.5	4.26
Grampian Hills	31	53	19	−2	29.1	4.55	4, 19	70	6, 27	28	45.0	4.37

Meteorology of 1867—Continued.

Stations in States and Territories.	MARCH. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	APRIL. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
PENN'A—Cont'd.		*Deg.*		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
Connellsville	31	57	18	0	33.8	......	14	76	6	29	51.3	......
Newcastle	1	56	18	3	32.0	......	30	69	12	27	48.1	......
Canonsburg	31	67	18	2	33.7	4.01	4	80	6	28	49.4	1.37
Averages	......	......	......	......	34.0	4.10	......	......	......	......	50.0	2.54
DELAWARE.												
Delaware City	31	64	18	22	36.7	......	......	......	......	......	......	......
MARYLAND.												
Woodlawn	31	66	15, 18	20	36.5	6.35	22	74	19	38	52.7	2.78
Catonsville	31	58	18	15	34.9	......	15, 22	70	27	24	50.5	......
Annapolis	2	63	18	20	40.6	10.25	22	84	3	38	55.1	2.16
St. Inigoes	31	69	15	26	40.2	10.87	22	78	1	36	56.6	1.56
Emmittsburg	31	62	15	16	35.1	......	13, 18, 20	75	24	33	52.1	......
Averages	......	......	......	......	37.5	9.16	......	......	......	......	53.4	2.17
VIRGINIA.												
Cape Charles L. H.	2	62	15, 19	26	39.7	7.27	22	77	3, 6, 12	42	53.4	1.69
Lynchburg	11	64	15	28	42.8		......	......	......	......	......	......
Mt. Solon	12	70	18	17	49.0	7.27	12, 21	78	5, 6	38	56.3	......
Hewlet's	......	......	......	......	......	......	22	86	29	44	63.6	......
Averages	......	......	......	......	40.5	7.27	......	......	......	......	57.8	1.69
WEST VIRGINIA.												
Grafton	31	62	15, 18	10	40.7	11.25	4, 14	82	1, 3, 7	30	55.0	3.13
Cabell C. H	1	64	14	20	42.0	5.60	14	78	6	40	57.9	2.00
Weston	12, 24	63	18	10	40.5	......	......	......	......	......	......	......
Averages	......	......	......	......	41.1	8.43	......	......	......	......	56.5	2.67
NORTH CAROLINA.												
Goldsboro'	2, 4	64	15	30	48.3	9.63	22	89	7	41	63.4	4.29
Raleigh	2	77	15, 16	28	45.2	6.10	22	89	3	36	59.9	3.10
Oxford	2, 11	69	16	25	44.8	2.19	9	81	2	35	61.1	4.60
Albemarle	2	76	18	22	45.7	8.89	22	88	7	26	58.1	3.72
Statesville	2	74	18	23	41.8	10.00	22	84	7	28	55.2	4.06
Averages	......	......	......	......	45.2	7.36	......	......	......	......	59.5	3.95
SOUTH CAROLINA.												
Aiken	3	76	15, 16	30	49.7	5.11	23	82	6	39	61.7	3.83
GEORGIA.												
Atlanta	4	80	14	28	48.0	5.74	......	......	......	......	......	......
ALABAMA.												
Opelika	4	84	17	33	54.2	......	21	83	2	45	61.8	......
Carlowville	4, 12	82	14	29	57.3	7.80	21, 22	84	1, 6	43	67.6	6.37
Prairie Bluff	2	84	14	28	57.8	......	22	89	7	43	65.7	......
Moulton	1, 2, 3	70	14	21	47.4	8.65	21, 22	80	6	34	60.6	8.95
Havana	2	83	14	24	54.3	8.77	21	86	5	39	63.7	4.01
Averages	......	......	......	......	54.2	8.41	......	......	......	......	63.9	6.44

Meteorology of 1867—Continued.

Stations in States and Territories.	MARCH.						APRIL.					
	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
FLORIDA.		*Deg.*		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
Fernandina	3, 12	82	16	40	60. 1	4. 45	30	86	3, 6	50	63. 3	2. 23
Jacksonville	......	......	......	......	......	......	20, 30	88	13	50	69. 9	1. 85
Port Orange	13	88	17	54	67. 0	......	10, 24	83	13	57	72. 1	......
Gordon	6	88	18	43	66. 4	......	......	......	......	......	......	......
Averages	......	......	......	......	64. 5	4. 45	......	......	......	......	68. 4	2. 04
TEXAS.												
Columbia	26	93	14	24	60. 7	3. 08	9, 23	93	1	40	71. 3	2. 70
Chapel Hill	24	79	9	34	......	......	......	......	......	......	......	......
Waco	......	......	......	......	......	......	7	83	29	42	60. 6	5. 80
Austin	1	85	13, 14	21	51. 5	1. 48	21	92	1	46	67. 9	1. 45
Averages	......	......	......	......	56. 1	2. 28	......	......	......	......	66. 6	3. 32
LOUISIANA.												
Vidalia	12	84	14	27	56. 3	......	29	88	1	46	68. 4	12. 00
MISSISSIPPI.												
Grenada	......	......	14	20	......	......	13	70	6	34	......	......
Fayette	3	81	14	23	52. 1	......	21, 29	81	1	40	61. 8	......
Natchez	2, 3	29	14	24	54. 9	5. 05	29	80	1	37	......	7. 65
Kingston	3	81	14	27	55. 2	3. 50	3, 17	76	1, 7	43	......	9. 62
Averages	......	......	......	......	54. 1	4. 28	......	......	......	......	61. 8	8. 64
ARKANSAS.												
Helena	......	......	......	......	......	......	21	85	1	38	60. 4	5. 36
Fort Smith	1	80	14	10	40. 3	......	......	......	......	......	......	......
TENNESSEE.												
Tusculum College	11	69	14	16	44. 2	......	21, 30	78	1, 5	39	56. 3	......
Lookout Mountain	1, 3	71	14	15	45. 2	......	21	80	6	40	58. 3	......
Clarksville	1	74	14	11	39. 9	8. 28	21	84	6	39	57. 6	4. 90
Averages	......	......	......	......	43. 1	8. 28	......	......	......	......	57. 4	4. 90
KENTUCKY.												
Chilesburg	1, 24	64	14	12	37. 4	8. 61	14, 17, 19	76	6	30	55. 5	3. 67
Louisville	1	64	14	10	37. 4	6. 61	20	77	6	29	56. 7	3. 05
Danville	24	65	14	14	40. 3	10. 25	21	85	5	36	57. 1	3. 63
Lexington	1, 24	61	14	10	36. 0	9. 31	9, 20	74	6	32	53. 0	4. 05
Averages	......	......	......	......	37. 8	8. 70	......	......	......	......	55. 6	3. 60
OHIO.												
New Lisbon	1, 24, 31	56	18	— 1	32. 5	4. 91	20, 30	72	6, 12, 28	30	50. 2	3. 09
East Fairfield	31	55	19	6	31. 7	2. 98	4	69	6	29	49. 7	3. 23
Steubenville	......	......	......	......	......	......	......	61	......	43	57. 0	3. 80
Martin's Ferry	31	64	18	10	37. 3	......	4	76	12	32	52. 2	......
Painesville	31	56	14, 18	6	29. 8	......	14	72	6	26	45. 5	......
Milnersville	1	58	18	— 3	32. 6	1. 72	19	79	3	24	51. 3	2. 20
Cleveland	1	58	14	10	32. 3	......	14	77	11	32	50. 6	......
Do	1	58	15	9	31. 6	2. 73	14	78	11, 27	29	47. 1	3. 21
Wooster	31	63	18	6	32. 7	......	14	74	6	33	51. 7	......
Gallipolis	......	......	......	......	......	......	14	78	6	31	55. 9	2. 83
Kelly's Island	31	54	14	9	31. 1	1. 98	14	69	5	32	47. 1	3. 27
Norwalk	31	60	14	8	31. 5	1. 62	13	74	6	28	48. 4	2. 63
Carson	......	......	......	......	......	......	30	76	5, 6	32	51. 3	......
North Fairfield	31	61	14, 15, 19	6	31. 3	2. 95	14	78	6	27	51. 5	6. 10
Westerville	31	58	14	10	35. 0	3. 79	14, 19, 30	74	12	31	52. 0	1. 77

Meteorology of 1867—Continued.

Stations in States and Territories.	MARCH. Date.	MARCH. Maximum temperature.	MARCH. Date.	MARCH. Minimum temperature.	MARCH. Mean temperature.	MARCH. Rain or melted snow.	APRIL. Date.	APRIL. Maximum temperature.	APRIL. Date.	APRIL. Minimum temperature.	APRIL. Mean temperature.	APRIL. Rain or melted snow.
OHIO—Continued.												
		Deg.		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
Kingston	10	60	14	10	34. 9	3. 11	14	78	6	33	52. 9	2. 21
Marion	1	55	18	2	30. 6	2. 79	30	70	6	29	48. 9	3. 55
Toledo	1	57	14	5	30. 8	2. 13	14	72	6	29	48. 6	3. 63
Bowling Green	31	60	18	5	31. 3	2. 35	14	80	6	28	48. 8	3. 96
Kenton	31	52	14	26	36. 3	2. 94	19	65	6	34	45. 2	4. 13
Urbana University	1	57	18	4	31. 7	3. 08	19, 20	76	1, 6	32	51. 2	3. 48
Hillsboro'	1, 10	58	14	8	33. 6	3. 04	19	73	6	32	52. 3	3. 29
Bethel	10	58	14	8	33. 7	2. 00	19	77	5, 6	30	52. 3	1. 75
Cincinnati	1, 10	59	14	8	36. 0	2. 71	19	76	6	34	54. 4	2. 74
Do	1, 29	60	14	15	39. 9	1. 93	8	78	6	38	58. 4	3. 18
College Hill	10	59	14, 18	8	34. 2	3. 60	29	75	1	30	53. 0	3. 00
Farm School	1	59	14	8	34. 3	3. 03	29	73	2	28	51. 1	3. 25
Averages	......	......	......	......	44. 2	2. 74	......	......	......	......	51. 1	3. 24
MICHIGAN.												
Monroe City	1	54	15	3	29. 9	1. 54	14	74	11	30	48. 4	0. 79
Alpena	31	41	13, 14	6	26. 7	2. 66	17	52	5	27	......	......
State Ag. College	31	56	14	2	29. 7	0. 68	19	72	11	29	48. 2	2. 90
Litchfield	1, 10, 31	48	14	0	26. 8	1. 53	19	75	11	29	47. 1	3. 95
Grand Rapids	22	52	13	7	28. 2	......	13	78	5	26	46. 7	......
Kalamazoo	1, 9	46	14	9	29. 6	......	......	......	......	......	......	......
Northport	31	50	14	6	26. 0	......	13	70	9	22	39. 9	......
Otsego	......	......	......	......	......	......	16	70	5, 11, 22, 27	30	46. 2	......
Holland	1	51	13, 14	11	30. 4	1. 71	13	70	11	30	45. 4	2. 55
Ontonagon	30	46	14	—12	14. 8	......	13, 14, 28, 29	60	1, 2, 9, 10, 11, 22, 26, 27	28	38. 6	......
Homestead	31	52	6	3	26. 7	......	......	......	......	......	......	......
Averages	......	......	......	......	26. 9	1. 62	......	......	......	......	45. 1	2. 55
INDIANA.												
Richmond	1	58	14	3	31. 3	3. 32	19	73	6	32	50. 0	3. 05
Aurora	10	62	14	6	37. 6	3. 52	30	74	6	29	52. 8	2. 49
Vevay	1, 10	61	14	11	38. 6	5. 52	9	83	6	31	55. 7	1. 70
Muncie	1	57	18	0	31. 6	3. 22	19	78	1, 5, 6	33	50. 6	2. 60
Spiceland	1	56	14	2	31. 5	......	19	78	2	32	51. 3	0. 80
New Albany	1	66	14	10	37. 4	5. 04	......	......	......	......	......	......
Columbia City	1, 31	54	14	0	30. 7	1. 38	19	76	1, 11	32	44. 0	......
Indianapolis	1	57	14	8	35. 8	......	19	77	6	30	51. 4	2. 93
Rensselaer	1	52	5	— 5	26. 6	4. 30	19	72	6	28	46. 6	5. 75
Merom	1	54	14	2	31. 4	2. 45	19, 20	72	2, 6	32	51. 6	1. 80
New Harmony	1	62	14	9	35. 5	3. 96	19, 21	77	6	39	56. 1	2. 03
Averages	......	......	......	......	33. 5	3. 63	......	......	......	......	51. 0	2. 46
ILLINOIS.												
Chicago	30	53	14	— 4	31. 4	1. 58	13	71	2	33	46. 4	1. 70
Near Chicago	1	51	14	— 6	29. 9	......	3	74	22	30	47. 5	......
Golconda	24	65	13	10	39. 8	4. 50	30	94	26	26	59. 9	0. 70
Aurora	1	48	14	— 6	24. 7	1. 12	18	67	5	29	45. 3	2. 39
Sandwich	22	48	12, 13	0	25. 9	4. 30	19	72	5, 6, 11	30	46. 6	2. 45
Ottawa	1	54	14	1	31. 7	1. 42	19	78	5	33	50. 6	1. 72
Winnebago	1	43	14	— 8	23. 8	1. 58	19	70	5	28	45. 0	1. 43
Dixon	20	64	14	—10	27. 7	......	12, 29	72	2, 6	26	48. 4	......
Hennepin	......	......	......	......	......	......	18	76	6	28	48. 0	......
Magnolia	1	53	14	—10	26. 5	3. 33	7	80	6, 11	28	48. 5	2. 00
Lacon	1	50	14	— 7	27. 3	2. 50	18	76	2, 5, 6	30	50. 8	2. 81
Rochelle	22	49	14	— 8	26. 9	......	18, 19	72	1, 2, 6, 11	28	47. 3	......
Wyanet	1	48	13	— 7	27. 1	0. 60	18	71	1	27	47. 8	2. 00
Tiskilwa	1, 22	50	14	— 7	28. 6	1. 35	19	74	1	27	48. 3	......
Elmira	22	48	13	— 6	28. 0	1. 95	18	73	5	30	49. 5	2. 27
Peoria	1	52	14	— 6	29. 4	1. 74	18	73	2	30	51. 1	1. 57
Springfield	20	58	14	— 2	29. 2	......	19	74	6	28	49. 4	......

Meteorology of 1867—Continued.

Stations in States and Territories.	MARCH. Date.	MARCH. Maximum temperature.	MARCH. Date.	MARCH. Minimum temperature.	MARCH. Mean temperature.	MARCH. Rain or melted snow.	APRIL. Date.	APRIL. Maximum temperature.	APRIL. Date.	APRIL. Minimum temperature.	APRIL. Mean temperature.	APRIL. Rain or melted snow.
ILLINOIS—Cont'd.												
		Deg.		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
Loami	1	64	14	— 4	30. 1	1. 90	18, 19	80	2	32	52. 4	0. 45
Waterloo	1	66	14	— 3	31. 5	......	19	79	1	33	53. 1	......
Dubois	1	56	14	2	30. 4	3. 53	21	79	6	25	48. 8	1. 15
Galesburg	1	51	14	— 7	25. 2	0. 84	18	72	10	28	48. 1	1. 16
Manchester	1	60	14	— 3	29. 6	1. 95	21	78	2	30	52. 8	0. 47
Mount Sterling	22	54	13	— 6	30. 0	......	19	81	5	33	53. 2	......
Andalusia	1	50	14	— 6	28. 8	......	18	75	1	26	48. 0	......
Augusta	1	52	13	— 5	28. 6	1. 67	18	74	2	31	52. 6	2. 00
Averages	......	......	......	......	28. 9	2. 11	......	......	......	......	49. 6	1. 64
WISCONSIN.												
Manitowoc	1	48	14	— 6	26. 3	1. 80	25	62	5	27	42. 2	2. 00
Plymouth	31	52	14	—13	23. 5	2. 59	14, 16, 17	65	4, 9	28	43. 9	1. 70
Milwaukee	1	47	14	— 7	26. 2	1. 81	29	65	5	28	42. 9	1. 73
Do	1, 31	47	14	- 4	27. 4	1. 10	12	66	5	31	44. 0	1. 75
Appleton	......	......	......	......	......	......	13	67	27	27	43. 8	2. 15
Delavan	1	44	14	— 8	24. 3	1. 63	19	69	1	27	44. 2	1. 09
Waupacca	31	55	13	—10	25. 5	......	19	69	5	25	45. 3	......
Do	......	......	......	......	......	......	16, 19	68	9, 11	18	40. 5	3. 70
Embarrass	30	51	14	—17	18. 6	2. 45	19	72	8	25	41. 2	2. 41
Rocky Run	31	47	14	—11	24. 5	2. 88	19	67	5	29	44. 7	2. 78
Beloit	30, 31	44	14	— 6	26. 0	0. 51	18, 19	68	5	28	46. 5	......
Baraboo	22	52	14	— 6	35. 7	2. 30	16	74	9	26	45. 0	6. 25
New Lisbon	22	58	14	—17	24. 6	......	19	74	2, 9	25	46. 1	......
Bayfield	30	60	14	—16	19. 5	......	12, 19	64	9, 27	26	42. 0	......
Averages	......	......	......	......	24. 7	1. 89	......	......	......	......	43. 7	2. 56
MINNESOTA.												
Beaver Bay	30	56	14, 15	—17	13. 7	......	16	62	2, 5, 10	25	38. 2	1. 43
Red Wing	30	48	13	—14	18. 3	1. 80	12	67	8	25	42. 7	2. 68
Afton	20	47	14	—18	15. 4	......	17	67	2	19	42. 0	......
St. Paul	20	42	13	—22	13. 2	1. 60	17	60	2	17	40. 2	2. 93
Minneapolis	30	44	11	—22	12. 4	1. 28	19	64	2	21	41. 4	0. 40
Sibley	20	40	11, 13	—20	8. 1	1. 17	25	60	2	7	37. 9	1. 82
New Ulm	20	46	5, 12	—15	11. 5	0. 94	19, 28	64	2	13	44. 4	1. 73
Averages	......	......	......	......	13. 2	1. 24	......	......	......	......	41. 0	1. 83
IOWA.												
Clinton	24, 28, 31	42	14	— 8	26. 5	6. 00	18	68	2	20	46. 0	1. 75
Lyons	1	54	13, 17	— 7	24. 7	1. 47	16, 19	70	1	28	46. 5	1. 48
Davenport	1, 22	45	14	— 8	24. 5	3. 00	18	70	1, 2	30	47. 5	3. 91
Dubuque	22	45	14, 17	— 7	26 0	2. 02	18	71	5	29	47. 6	1. 32
Atalissa	22	49	13, 14	— 5	24. 6	2. 53	18	73	5	29	46. 0	2. 83
Monticello	22	47	13, 14	— 2	24. 6	1. 35	16, 18, 19	70	1	30	46. 8	1. 25
Fort Madison	1	52	14	—12	27. 5	3. 37	18	75	2, 6	27	48. 6	3. 25
Guttenberg	22, 31	49	14	—20	21. 1	1. 75	18	76	2	23	43. 3	......
Ceres	22	50	14	—10	24. 8	......	18	72	1, 4, 5	30	46. 7	......
Mt. Vernon	22	51	14	—15	22. 7	......	18	75	2	20	45. 2	......
Iowa City	22	47	13	—13	25. 7	2. 50	18, 19	70	1, 2, 6	27	47. 1	0. 95
Independence	20	43	14	—16	20. 7	......	18	70	1	27	44. 5	......
Near Independence	22	50	14	—26	18. 8	3. 00	18	76	1	24	44. 1	3. 10
Waterloo	21	44	14	—20	20. 4	......	18	70	1, 2	26	44. 5	......
Iowa Falls	1	40	14	—19	15. 4	3. 17	19	72	1	10	37. 8	2. 14
Algona	6	36	14	—25	9. 2	......	19	61	9	16	38. 9	......
Do	......	......	......	......	......	......	28	62	9	16	40. 2	......
Dakota	......	......	......	......	......	......	28	66	7	12	38. 8	......
Fontanelle	31	52	13	—17	18. 0	1. 30	12, 19	68	5	27	44. 4	2. 50
Harris Grove	31	44	13	—16	18. 6	2. 75	12	67	9, 11	23	43. 4	1. 60
Fort Dodge	31	37	14	—19	14. 4	2. 11	12	64	9	22	40. 9	1. 37
Averages	......	......	......	......	24 6	2. 59	......	......	......	......	44. 2	2. 11

Meteorology of 1867—Continued.

Stations in States and Territories.	MARCH. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	APRIL. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
MISSOURI.		*Deg.*		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
St. Louis Univer'y	1	69	14	5	33.9	1.73	21	82	2, 6	39	56.3	0.69
Allenton	1	78	14	0	33.4	2.76	21	91	6	28	55.0	0.89
Union	1	76	14	3	34.2	1.30	21	86	1	34	56.2	1.14
Canton	21	57	5	—12	27.6	1.37	18	73	2, 11	31	49.3	2.50
Rolla	1	74	14	2	39.2	2.40	......	......	......	......	......	......
Harrisonville	1	52	14	—12	28.2	4.90	20	80	5,6,10,11	34	52.1	4.91
Oregon	20	53	13	— 7	25.2	2.95	12	72	1	27	51.2	2.49
Averages	......	......	......	......	30.4	2.49	......	......	......	......	53.4	2.10
KANSAS.												
Leavenworth	22	50	14	—18	25.7	2.75	18	79	6	25	51.1	2.77
Olatha	1	54	14	— 8	25.9	3.10	20	78	5, 10, 11	32	50.1	......
Atchison	31	49	14	—14	24.2	4.60	21	75	11	29	49.1	5.40
Lawrence	......	......	......	......	......	......	20	72	5	30	48.9	4.81
State Ag. College	30	52	14	— 9	24.8	0.63	13, 21	75	5, 10	31	50.2	2.44
LeRoy	1, 18	57	13	— 2	30.7	3.11	20	87	6	23	55.3	1.52
Council Grove	1, 30	50	14	—17	21.0	0.30	21	77	11	28	50.3	2.70
Averages	......	......	......	......	25.4	2.42	......	......	......	......	50.7	3.27
NEBRASKA.												
Elkhorn	20, 30, 31	40	13, 14	—12	14.6	1.83	28	70	5	26	44.0	......
De Soto	......	......	......	......	......	......	28	69	9	21	44.5	......
Bellevue	......	......	......	......	......	......	20	79	4, 5	30	46.6	1.78
Glendale	31	45	13	—13	16.9	2.12	12	73	9	27	45.7	2.80
Averages	......	......	......	......	15.8	1.98	......	......	......	......	45.2	2.29
UTAH TERRITORY.												
Wanship	22	53	13	—30	20.9	......	20	64	4	16	37.2	......
CALIFORNIA.												
Sacramento	31	69	6	37	50.1	1.02	......	......	......	......	......	......
Monterey	29, 30	65	23	36	51.2	3.31	26	85	3	38	57.0	3.68
Averages	......	......	......	......	50.7	2.17	......	......	......	......	57.0	3.68
OREGON.												
Albany	28, 29	60	13	16	38.2	2.95	24	68	1	38	......	......
Corvallis	25	58	13	20	37.6	......	25, 30	75	17	34	53.2	5.20
Averages	......	......	......	......	37.9	2.95	......	......	......	......	53.2	5.20
MONTANA TER.												
Helena City	31	44	12	—28	5.9	0.60	......	......	......	......	......	......
Camp Cooke	......	......	......	......	......	......	11, 20, 27	71	4	20	44.8	1.41

Stations in States and Territories.	MAY. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	JUNE. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
MAINE.												
Steuben	28	70	3	21	47.4	7.50	13	81	8	43	60.5	3.60
Lee	29	70	4	31	53.0	6.10	30	82	8, 10	48	61.3	1.15
Williamsburg	28	65	3	29	46.1	8.40	......	......	......	......	......	......
West Waterville	28	71	4	34	51.6	4.87	22, 30	87	3, 10, 26	52	66.6	1.65
Gardiner	28	69	4	36	51.3	5.27	28	79	8	48	64.3	1.96
Lisbon	......	......	......	......	......	8.76	......	......	......	......	......	3.12
Standish	27, 28	74	3	34	52.1	5.26	15, 30	86	8, 26	49	66.8	2.70
Rumford Point	28	71	4	30	52.1	7.45	14, 28	83	1	47	66.6	3.05
Cornish	28	72	3, 4	32	49.8	4.09	22, 30	81	8, 9	50	65.7	1.49
Cornishville	25, 28	72	3	32	50.6	3.49	15, 30	81	8	48	67.2	2.91
Averages	......	......	......	......	50.4	6.12	......	......	......	......	69.4	2.40

Meteorology of 1867—Continued.

Stations in States and Territories.	MAY.						JUNE.					
	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
NEW HAMPSHIRE.		Deg.		Deg.	Deg.	In.		Deg.		Deg.	Deg.	In.
Portsmouth	28	71	4	32	53.5	3.31	30	85	9, 10	50	66.0	2.63
Stratford	25	68	3	26	47.0	6.23	23	83	5	44	64.3	2.03
North Barnstead	28	72	3	34	51.1	3.72	15	86	8	48	66.8	2.51
Concord	25, 28	72	3	32	54.0	3.92	22	90	10	46	67.9	1.83
Claremont	25, 28	74	4	30	53.0	6.01	24, 30	86	9	45	66.8	4.15
Averages					51.7	4.64					66.4	2.63
VERMONT.												
Lunenburg	22	72	4	24	49.1	10.38	11	84	18	40	65.7	3.75
North Craftsbury	25, 28	64	3	28	47.3	6.88	15, 23	84	8	47	65.0	2.65
Randolph	28	72	3, 4	28	50.7	6.03	24	87	1	48	69.5	2.70
Middlebury	1	70	3	31	51.7	7.19	24, 30	80	1	54	66.9	2.84
Brandon	21	75	3, 4	32	53.2	7.62						
Barnet	29	73	12, 17	42	54.3	6.15						
Averages					51.1	7.38					66.8	2.99
MASSACHUSETTS.												
Kingston	25	68	4	33	50.7	4.25	6	84	10	42	63.4	1.38
Topsfield	25, 28	72	3	37	55.5	3.67	30	86	9	48	67.8	2.84
Lawrence	27, 28	71	3, 4	34	50.4	3.46	24, 30	84	9	50	62.9	3.56
Georgetown	28	72	4	32	52.9		13	87	9	48	65.5	
Newbury	30	74	3, 4	33	58.5		28	89	9	47	66.9	
North Billerica	25, 30	77	3, 4	32	54.7		7	88	8	52		
West Newton	25	80	3, 4, 5	38	55.4		7	96	8	53	71.2	3.03
New Bedford	28	73	3, 4	38	53.5	3.67	5, 28	79	8, 9	49	65.0	2.44
Do	28, 29	75	4	36	55.2	3.70	24	85	10	46	67.2	2.06
Worcester	28	75	4	36	54.3	4.91	7	85	9	52	67.2	3.32
Mendon	28	77	3, 4	33	53.6		24	84	9	49	67.0	1.60
Lunenburg	28	76	4	34	53.3	8.10	24	88	8	51	67.2	6.05
Amherst	28	76	3	36	54.1	4.61	6	85	10	51	67.1	5.67
Richmond	28	80	3	28	54.4	9.47	16	92	8	50	72.1	4.50
Williams College	6	68	3	32	51.6	5.90	7	87	10	51	67.0	1.47
Averages					53.5	5.17					67.0	3.16
RHODE ISLAND.												
Newport	29	78	3, 4	35	53.3	3.29	20	84	8, 9	48	64.6	3.50
CONNECTICUT.												
Pomfret	28	74	3	33	52.7	5.07	13, 24, 30	80	9	45	63.4	4.91
Columbia	27	80	3	35	54.0		13, 28	86	9	50	68.0	
Middletown	28	81	4	36	55.9	4.53	13	89	10	48	68.7	5.39
Colebrook	28	76	2	32	57.4		7	87	8, 9	52	66.7	
Groton							6, 13	84	9, 10	48	66.7	5.24
Averages					55.0	4.80					66.7	5.18
NEW YORK.												
Moriches	29	80	3	37	57.5	5.64	29	85	10	51	68.7	8.13
South Hartford	29	75	2	38	56.7	8.50	30	87	1, 10	54	71.6	10.95
Troy	29	73	3	34	53.8	5.74	7, 30	89	1	59	71.3	3.24
Germantown	29	81	3	34	55.7	8.60	13, 24, 30	90	1, 12	58	71.4	5.40
Garrison's	29	81	3	34	55.6	7.86	30	87	9	50	68.0	4.93
Throg's Neck	29	82	3	37	55.8		28, 30	88	9	50	69.0	
White Plains	29	81	14	33	54.3		6, 7, 8, 13	82	9	48	67.8	
Deaf and Dumb In.	29	79	3	35	52.8	5.70	30	91	9	47	68.5	10.18
Columbia College	29	81	3	37	55.6	3.94	30	87	9	47	69.0	5.37
St. Xavier's College	29	84	3	42	57.0	5.75	6	87	9	47	69.8	
Flatbush	27	81	3	35	55.0	4.02						
Newburgh	29	80	3	35	56.6	5.57	6	90	11	56	71.0	5.02
Gouverneur	25	69	3	31	50.3	6.92	24	86	5	54	68.3	1.73
North Hammond	25	72	3, 4	32	50.6	8.00	24	90	1	54	69.2	1.33
South Trenton	29	70	3	28	47.3	7.62	15	94	1	48	68.6	5.30
Cazenovia	28	79	2	28	51.0		24	90	1, 19	55	68.4	
Oneida	29	75	2, 3	32	50.6	12.61	30	93	4	55	68.9	7.43

Meteorology of 1867—Continued.

Stations in States and Territories.	MAY. Date.	MAY. Maximum temperature.	MAY. Date.	MAY. Minimum temperature.	MAY. Mean temperature.	MAY. Rain or melted snow.	JUNE. Date.	JUNE. Maximum temperature.	JUNE. Date.	JUNE. Minimum temperature.	JUNE. Mean temperature.	JUNE. Rain or melted snow.
NEW YORK—Con.		*Deg.*		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
Houseville	29	72	3	22	48.2	6.82	30	88	1	50	68.0	2.24
Depauville	21	68	3	30	48.9	5.90	24, 25	87	1	52	67.6	2.22
Theresa	......	......	......	......	......	6.90	......	......	......	......	......	1.13
Oswego	25	69	2, 3	32	47.4	6.57	30	88	4, 5	52	66.2	1.41
Palermo	29	72	3	27	47.5	6.90	30	90	9	51	68.0	1.60
Baldwinsville	......	......	3	29	......	......	......	......	......	......	......	......
Skaneateles	29	70	2	30	50.8	......	......	......	......	......	......	......
Nichols	29	83	2, 3	32	52.4	......	7	95	1	48	69.1	......
Geneva	29	70	2, 3	31	49.7	6.59	30	88	1	51	68.3	2.05
Rochester	25	67	2	28	49.5	5.69	30	90	1	53	69.5	1.40
Rochester Univer'y	25	67	2	29	49.6	5.69	14, 23, 27	85	1	55	69.7	1.40
Little Genesee	29	80	3	24	49.2	8.70	30	91	1	44	68.3	1.50
Friendship	29	79	2	26	48.7	......	30	89	1	50	66.8	1.90
Buffalo	28	65	2	25	47.0	4.26	23	93	4	52	70.3	1.77
Averages	......	......	......	......	51.9	6.69	......	......	......	......	68.9	3.81
NEW JERSEY.												
Paterson	29	86	3, 4	37	56.3	5.97	16	92	9, 11	50	69.9	8.49
Newark	29	80	4	35	55.3	6.55	16	84	11	45	66.9	9.75
New Brunswick	29	83	3	40	56.6	6.45	30	86	9	50	68.8	10.90
Trenton	29	83	4, 6	40	60.8	5.32	16, 30	86	9	52	73.1	9.19
Burlington	29	84	3	37	57.7	8.50	30	85	9, 10	50	68.7	8.85
Moorestown	29	85	3	36	56.8	7.38	......	......	......	......	......	......
Mount Holly	29	83	4	34	57.4	......	15, 30	85	11	50	68.8	......
Seaville	29	86	3	32	57.6	9.60	30	88	11	42	67.4	11.55
Dover	29	80	3, 5	37	55.5	6.71	6, 30	84	9, 11	51	67.5	8.28
Readington	29	86	4	30	60.4	......	13, 30	88	11	52	67.8	......
Haddonfield	29	85	3	37	56.6	6.49	14, 30	85	11	50	68.6	6.41
Greenwich	29	86	3, 4	40	58.9	6.89	28, 30	86	9	53	70.1	5.45
Averages	......	......	......	......	57.5	6.99	......	......	......		68.9	8.96
PENNSYLVANIA.												
Nyces	29	83	3	30	50.9	11.00	30	85	2, 11	45	65.4	3.70
Fallsington	29	85	3	37	56.7	7.75	15	87	9	52	69.0	8.00
Philadelphia	29	87	3	39	58.5	7.07	15, 16, 30	88	9	51	71.5	10.95
Germantown	29	88	3	36	60.4	......	17	88	10, 11, 12, 15	56	72.5	......
Horsham	29	82	3	38	53.7	6.67	30	84	9	50	64.6	12.67
Dyberry	29	80	3	28	50.0	......	7	88	1	46	65.2	......
Whitehall	29	78	4	30	54.3	......	16, 30	84	11	43	67.4	......
Parkesville	29	88	4	36	56.9	8.42	30	89	11	43	69.5	8.65
Reading	29	90	3	38	58.0	......	6	94	11	50	71.6	......
Ephrata	29	90	3	38	59.5	8.37	13, 30	90	11	56	72.5	6.53
Silver Spring	29	87	3	37	57.0	......	16	93	10	51	71.0	......
Mount Joy	29	88	3, 5	44	59.0	5.35	16, 30	88	11	54	71.2	5.25
Harrisburg	29	85	3	40	58.2	5.72	6	89	11	57	73.3	3.64
Ickesburg	......	......	......	......	......	......	15, 30	89	11	55	70.1	5.16
Lewisburg	29	84	3	35	54.0	8.52	30	86	10	57	70.4	4.92
Tioga	29	83	3	26	49.3	12.46	7	98	1, 2, 11	50	69.5	1.70
Fleming	29	82	3	32	51.5	6.13	30	87	1	51	67.1	2.43
Grampian Hills	28	83	3	28	48.8	7.18	7	90	1	49	67.5	1.32
Connellsville	28	86	3	38	53.7	......	25, 27, 30	88	19	56	72.5	......
New Castle	28	81	3	26	51.7	......	7, 14, 27	87	1	44	69.2	......
Canonsburg	28	83	3	36	54.4	5.10	6, 23, 27	86	1	52	71.0	1.97
Averages	......	......	......	......	54.8	7.07	......	......	......	......	69.7	5.49
MARYLAND.												
Woodlawn	29	90	3	38	60.0	7.56	30	89	10	52	71.6	3.74
Catonsville	29	84	3	38	58.7	......	16	87	10, 11	56	70.2	......
Annapolis	29	87	3, 4	44	60.0	6.64	30	88	11	56	72.4	6.41
St. Inigoes	......	......	8	44	61.5	5.56	14, 30	89	9	54	73.4	3.73
Emmittsburg	29	82	3, 8	40	57.3	......	30	92	11	54	71.2	......
Averages	......	......	......	......	59.5	6.59	......	......	......	......	71.8	4.63

Meteorology of 1867—Continued.

Stations in States and Territories.	MAY.						JUNE.					
	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
VIRGINIA.												
		Deg.		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
Cape Charles L. H.	29	86	8	40	61.7	5.40	28	84	9	56	70.8	13.54
Surry Court House	29, 30	90	8	47	65.9	......	29	92	9, 10	58	75.1	......
Hewlett's Station	29	89	2, 8, 16	46	61.8	5.60	30	88	1	46	69.6	5.50
Mount Solon	29	92	1, 3	40	60.8	......	15, 30	86	11	56	72.2	......
Lynchburg	29	80	8	45	......	......	30	84	11	52	......	......
Averages	......	......	......	......	62.6	5.50	......	......	......	......	71.9	9.52
WEST VIRGINIA.												
Romney	......	......	......	......	......	......	6	92	1, 10	58	72.3	......
Grafton	28	90	9	39	62.7	4.88	17	94	1	56	......	1.20
Cabell Court House	13, 28	82	9	41	60.0	4.88	29	88	20	58	74.0	0.10
Averages	......	......	......	......	61.4	4.88	......	......	......	......	73.2	0.65
NORTH CAROLINA.												
Goldsboro'	29	95	9	47	69.0	6.86	30	92	10, 11	59	75.3	15.15
Oxford	28, 29, 30	80	8	43	64.3	6.50	30	87	11	55	73.1	8.35
Raleigh	29	93	8	43	66.0	5.80	30	99	10	57	75.2	14.40
Albemarle	28, 29, 30	88	9	34	63.8	9.73	30	93	1	54	72.7	9.04
Statesville	28, 29	84	9	36	60.4	6.19	14	86	11	50	69.2	6.75
Asheville	29	82	8	47	62.2	......	30	85	9	59	69.6	14.40
Averages	......	......	......	......	64.3	7.02	......	......	......	......	72.5	11.65
SOUTH CAROLINA.												
Aiken	28, 29	86	7	51	68.9	......	27	91	11	61	73.0	11.49
ALABAMA.												
Moulton	12	82	8	41	68.2	1.82	9, 10	85	19	61	75.3	5.43
Prairie Bluff	12, 27, 28, 29	89	8	47	72.2	......	15	96	2	73	81.6	......
Opelika	28	90	8	46	69.9	......	10	91	12	69	77.8	......
Havana	11, 27	86	8	44	67.7	5.29	10	91	4, 5	65	77.3	2.84
Carlowville	27	89	8	48	76.8	4.41	14, 28	92	2	70	81.6	4.52
Averages	......	......	......	......	71.0	3.84	......	......	......	......	78.7	4.26
FLORIDA.												
Fernandina	10	86	8	50	72.4	2.60	29	88	22	70	77.4	6.90
Jacksonville	30	92	9	57	75.6	2.85	29	97	4, 5, 6, 11, 22	72	80.5	10.49
Gordon	12	95	9	48	74.3	......	2, 16, 25, 29	92	10, 11	70	79.4	......
Port Orange	10	88	9	59	75.8	......	29	88	9, 11, 22	74	79.8	......
Averages	......	......	......	......	74.5	2.73	......	......	......	......	79.3	8.70
TEXAS.												
Houston	18, 19, 27, 30	94	7	56	75.6	......	24	100	1	68	82.0	......
Columbia	31	93	7	52	76.3	8.18	21	97	1, 3	72	81.6	6.55
Waco	9	92	1, 7	51	73.0	6.50	21	101	1	66	82.6	2.80
Austin	9	92	1	58	73.9	1.30	22	97	1	66	81.2	5.05
Averages	......	......	......	......	74.7	5.33	......	......	......	......	81.9	4.80
LOUISIANA.												
Vidalia	27	94	6	58	73.5	15.00	......	......	......	......	......	......
Benton	27	85	5, 6	58	72.2	......	19	72	2	65	83.2	......
Averages	......	......	......	......	72.9	15.00	......	......	......	......	83.2	......

Meteorology of 1867—Continued.

Stations in States and Territories.	MAY. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	JUNE. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
MISSISSIPPI.		Deg.		Deg.	Deg.	In.		Deg.		Deg.	Deg.	In.
Grenada	30	80	8	42			22, 23	90	4	60		
Fayette	27	88	6	53	67.2		24	86	2, 4	64	74.9	
Natchez	27	84	7	50	69.9	11.27	25	88	20	66	76.8	4.76
Averages					68.6	11.27					75.9	4.76
ARKANSAS.												
Helena	27	86	2, 6	48	69.6	7.76						
TENNESSEE.												
Tusculum College	28	90	8	42	62.3		20	87	3, 4, 7	63	73.1	
Lookout Mountain	28	84	8	38	64.0		29	88	12	66	75.2	
Clarksville	4, 12	81	7, 8	40	61.4	4.56	17	87	3	63	73.9	2.53
Franklin							23, 27, 28, 29	87	7	64	76.2	
Averages					62.6	4.56					74.6	2.53
KENTUCKY.												
Chilesburg	28	84	7, 8	40	59.4	4.66	29	92	1	54	73.1	4.86
Lexington	28	84	8	33	58.0	5.95	30	87	1, 4	56	71.0	3.71
Louisville	28	81	8	32	58.9	6.52	17, 30	90	1	55	72.0	4.58
Averages					58.8	5.71					72.0	4.38
OHIO.												
New Lisbon	28	82	3	36	54.2	4.88	14, 25	93	2	50	71.9	3.45
East Fairfield	28	83	3	29	52.1	4.12						
Steubenville					57.7	4.20					77.0	2.55
Martin's Ferry	28	85	3	39	54.9		28, 30	87	4	60	72.4	
Painesville	28	78	2	30	50.6	6.12	6	83	3	56		1.31
Milnersville			2	30			24	98	3, 19	54		2.85
Cleveland, (H.)	28	85	2	31	52.4	5.02	30	94	1	54	71.0	1.81
Cleveland, (S.)	29	78	2	32	53.2		30	98	8, 19, 20	60	74.3	
Wooster							30	91	19	58	73.9	
Gallipolis	28, 29	84	9	40	56.6	4.67						
Kelley's Island	5, 25	66	2	37	52.4	5.08	17, 30	88	1	58	72.4	1.19
Norwalk	4	73	9	32	52.7	2.39	30	90	9	56	70.8	1.45
Carson	28, 29	82	3	37	55.4		17	89	3, 4	61	74.5	3.21
North Fairfield	4, 29	75	3	33	53.8	7.10	30	90	1	54	69.2	2.76
Westerville	28	83	7	38	56.7	1.62						
Kingston	28	88	7	38	55.9	3.25			4	61		
Marion	28	81	3	37	52.7	3.09	30	89	3, 20	58	71.5	4.92
Hillsboro'	28	81	8	38	54.9	3.10	30	88	4	57	72.1	2.32
Toledo	30	72	2	36	52.3	5.50	6	91	1	55	71.1	1.94
Bowling Green	29	78	3	30	54.3	9.50	30	95	1, 19	51	72.0	5.25
Kenton	30	72	8	34	47.2	5.31	6	89	3, 4	60	74.3	4.63
Urbana University	28	82	3, 7	38	55.4	2.27	30	90	3, 4	58	73.3	4.08
Bethel	28	80	7, 8	37	56.0	2.75	6, 17, 30	86	3, 9, 10	58	71.8	3.00
Cincinnati (H)	28	80	8	40	58.0	3.80	30	88	4	60	74.1	3.73
Cincinnati (P)	28	86	8	42	62.2	4.38	25, 30	90	1	62	77.6	3.67
College Hill	28	84	4	35	55.9	4.15	22, 25, 30	90	1, 19	60	74.8	6.38
Farm School	29	78	7	34	55.2	1.98	14	91	3, 4, 18	58	73.7	5.50
Averages					54.5	4.29					73.0	3.30
MICHIGAN.												
Monroe City	30	76	2	38	53.1	2.23	15, 30	93	3	44	73.7	2.25
State Agr'l College	30, 31	70	2	30	51.1	3.81	23	92	3	55	71.6	2.83
Litchfield	30	72	3	28	50.6	8.97	23	93	3	55	68.4	2.56
Grand Rapids	31	79	2	28	49.7		23	96	3	53	72.7	
Northport	25	62	2	26	44.1		6, 29	86	1, 3, 4	48	64.1	
Holland	31	72	2	28	49.8	5.38						
Otsego	26, 31	70	2	29	48.2		8, 23	90	2, 3	50	68.7	
Copper Falls	31	61	2	20	41.2		11	80	2	44	60.1	3.42
Ontonagon	31	60	1, 2	30			23, 24	90	2	42	62.7	
Averages					48.5	5.10					67.8	2.77

Meteorology of 1867—Continued.

Stations in States and Territories.	MAY. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	JUNE. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
INDIANA.		Deg.		Deg.	Deg.	In.		Deg.		Deg.	Deg.	In.
Richmond	......	......	......	......	......	......	30	89	3	57	71.8	5.72
Aurora	28	87	8	31	59.8	3.49	17	94	1	59	74.9	4.70
Vevay	30	95	7	35	61.4	4.25	22	100	18	60	79.6	3.20
Muncie	28	81	2	36	54.7	5.08	30	94	3, 18	58	74.5	3.30
Spiceland	28	79	7	39	54.9	4.11	30	93	3	59	74.9	2.50
Columbia City	28	80	8	37	52.8	5.00	22, 23	96	18	56	78.3	2.00
Indianapolis	31	79	2, 8	36	54.3	......	22	96	19	57	74.3	......
Rensselaer	28	76	2	29	50.0	15.50	......	......	......	......	......	......
Merom	28	73	7, 8	36	55.8	5.71	24	84	1	56	73.4	1.10
New Harmony	28	80	7	40	61.2	4.62	24, 30	91	18	65	77.9	1.43
Averages	......	......	......	......	56.1	5.97	......	......	......	......	75.5	2.99
ILLINOIS.												
Chicago	28	73	2, 6	38	51.4	4.22	30	94	1	56	72.4	1.86
Near Chicago	28	80	7	62	51.7	......	6	100	1	54	74.3	......
Golconda	21	92	8	30	67.5	6.00	23	98	1, 3, 19	58	78.2	1.80
Aurora	30	71	2	30	46.6	5.24	22	90	2	48	72.0	3.41
Sandwich	30	73	2	29	50.9	7.58	22	96	1, 2	58	73.4	6.93
Ottawa	28	80	3	32	52.8	4.64	22	97	18	59	74.0	3.73
Winnebago	30	77	2, 6	32	49.4	4.65	8, 9, 30	92	1	55	72.3	3.74
Rochelle	28, 30	76	2, 7	34	51.0	......	22	96	1	54	73.0	......
Dixon	31	79	2, 7	30	51.1	......	......	......	......	......	......	......
Wyanet	30, 31	74	7, 8	31	53.0	6.62	22	93	1	54	73.5	3.30
Tiskilwa	31	75	7	34	52.3	......	22	96	1	55	73.6	......
Hennepin	31	75	3	29	52.0	......	6, 22, 30	92	18	52	70.0	......
Magnolia	30	85	7	28	52.5	10.00	9	95	19	54	73.9	5.70
Elmira	31	78	6	35	53.0	6.41	22	94	2	56	74.5	1.62
Peoria	31	75	7	35	55.2	4.40	6, 22	92	18	59	75.1	2.92
Springfield	12	84	6, 7	34	55.0	......	22	94	1, 2	54	74.6	......
Loami	4	79	7	34	56.5	5.40	22	97	1, 17	61	75.6	2.60
Dubois	30	88	8	22	52.8	5.90	23	94	3	50	74.2	5.18
Waterloo	20, 31	78	8	36	60.1	......	21, 22	96	1	58	78.0	......
South Pass	25	81	......	......	......	......	9	100	4	64	79.8	......
Galesburg	30, 31	74	6	36	50.3	6.38	22	89	1	58	73.9	3.13
Manchester	30	76	6	38	56.8	5.45	22	95	1, 2, 18	61	75.2	3.36
Mt. Sterling	31	80	6	35	58.6	......	14	93	2, 27	62	78.2	......
Andalusia	31	78	7	33	51.9	......	8, 9	91	1, 3	57	72.7	......
Augusta	30	72	6	37	57.5	4.99	22	87	18	61	77.0	3.65
Averages	......	......	......	......	53.8	5.86	......	......	......	......	74.6	3.53
WISCONSIN.												
Manitowoc	23	62	2	30	46.7	2.26	30	91	1	50	65.7	1.34
Plymouth	24	69	2	30	49.0	3.10	14, 22, 23	91	2	53	71.3	1.50
Milwaukee (L)	24	70	3	28	46.6	4.39	30	92	1	46	67.4	2.04
Milwaukee (W)	24	70	2	32	47.3	5.53	30	92	1	52	67.8	2.23
Appleton	27	72	2	28	48.5	2.20	......	......	......	......	......	......
Geneva	31	70	2	30	49.7	......	22	92	1, 3	54	72.1	......
Delavan	31	67	2	30	48.2	3.60	30	86	1	53	69.7	2.03
Waupacca (M)	30	71	2	30	50.4	......	23	92	1	50	72.6	......
Waupacca (W)	26	68	2, 3	26	47.7	2.70	7	90	1	50	69.5	4.70
Embarrass	27	74	2	23	46.1	1.38	9	98	1	48	68.2	3.70
Rocky Run	30	70	2	31	43.3	3.94	8, 9, 12	89	1	52	75.4	2.31
Beloit	30	74	2	32	49.6	3.85	22	88	1, 2	55	72.0	2.74
Baraboo	31	74	12	30	49.7	6.19	10	91	1	52	73.4	5.25
New Lisbon	11, 31	73	2	32	51.2	......	8	94	1	54	67.7	......
Galesville	31	71	......	......	......	......	12	89	2	54	70.2	......
Averages	......	......	......	......	48.2	3.56	......	......	......	......	70.2	2.78
MINNESOTA.												
Beaver Bay	29	67	1	25	44.9	1.64	11	86	4	44	59.1	7.46
Grand Portage	16	61	2	33	47.3	......	12	68	3	43	47.5	......
Redwing	26, 30	70	2	28	47.6	3.18	29	95	2	51	68.5	8.91
Afton	30	76	1	27	47.8	......	......	......	......	......	......	......

Meteorology of 1867—Continued.

Stations in States and Territories.	MAY. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	JUNE. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
MINNESOTA—Con.		*Deg.*		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
St. Paul	30	76	6	30	49.7	4.45	12	88	1	50	68.1	9.55
Minneapolis	30	70	1	28	48.5	3.63	13	86	2	51	68.1	9.24
Sibley	30	77	1, 2, 6	29	49.3	3.09	13	88	1, 2	53	69.4	7.24
New Ulm	30	78	1	29	52.0	3.72	29	93	1, 19	52	71.2	11.65
Averages	......	......	......	......	48.4	3.27	......	......	......	......	64.6	9.01
IOWA.												
Clinton	30	78	6	34	52.4	7.09	22	92	1	58	72.8	3.50
Lyons	31	75	6	33	52.0	5.40	......	......	......	......	......	......
Davenport	30, 31	71	6	36	51.5	10.32	10	88	1	52	72.6	3.88
Dubuque	30	77	6	36	52.1	3.10	9, 30	89	1, 2	56	73.1	6.80
Atalissa	31	78	6	33	51.0	5.33	......	......	......	......	......	......
Monticello	30	78	6	35	52.9	4.67	6	91	1	54	71.8	6.32
Fort Madison	31	81	6, 7	33	53.7	5.88	9	91	25	59	72.2	4.11
Guttenberg	30	80	7	27	48.4	......	6, 7, 8, 12	92	2, 3, 17	52	70.1	......
Ceres	30	78	2	28	51.1	......	6	94	1	54	73.2	......
Mt. Vernon	30	75	6	30	50.3	......	6, 8, 9	92	17	54	71.2	......
Iowa City	30	79	6	31	51.9	10.60	4, 12	90	18	50	70.5	3.94
Independence	30	78	6	34	51.0	7.95	7	91	1, 2	55	71.8	9.20
Near Independence	30	79	2	29	50.8	6.20	6	93	2, 27	53	72.4	10.40
Waterloo	30	76	5	32	51.0	......	22	88	17	52	69.8	......
Marble Rock	30	77	......	......	52.3	......	7, 30	86	28	52	70.0	......
Iowa Falls	17	64	2, 6, 7	30	46.6	7.64	30	88	2, 18	50	65.6	17.20
Algona (D)	30	77	2, 6	30	50.1	......	12, 29	90	1	52	69.6	......
Algona (W)	30	73	6	31	51.1	......	12	88	17	53	69.4	......
Dakota	30	78	2	30	51.9	......	5, 12, 21	90	2	52	68.4	......
Fort Dodge	30	75	6	31	51.6	4.07	5	91	1, 17	53	71.5	8.89
Fontanelle	3	78	6	36	53.6	6.68	22	92	2, 17	55	73.0	7.00
Harris Grove	3	80	6	29	52.0	4.50	29	88	17	47	68.0	4.20
Averages	......	......	......	......	51.4	6.38	......	......	......	......	70.9	7.13
MISSOURI.												
St. Louis	4	80	7	46	60.9	5.95	22	93	1	65	78.0	3.30
Allenton	3	87	7, 8	36	59.5	7.86	22	96	3	56	73.0	5.14
Union	4	83	7	44	61.5	7.05	22	99	17	58	76.6	2.56
Canton	31	73	2, 7	36	57.1	3.20	9, 12	89	1	64	76.3	......
Rolla	4, 12	81	1	29	57.6	7.32	22	90	28	49	70.8	1.09
Harrisonville	3, 8, 10, 14	78	13	45	58.6	10.61	3, 4, 23	90	17	58	73.9	2.58
Oregon	3, 8	82	2	38	58.3	5.84	4, 22	94	17	51	74.7	4.11
Averages	......	......	......	......	59.1	6.84	......	......	......	......	74.8	3.13
KANSAS.												
Leavenworth	8	90	6, 7	30	58.0	6.25	30	96	11	52	72.9	4.43
Olathe	3	80	5	37	57.9	8.40	30	97	17	54	76.3	2.95
Atchison	10	87	6	34	57.8	4.75	20	98	17	52	70.5	4.75
Lawrence	8	78	6	37	55.5	9.38	......	......	......	......	......	......
Holton	8	89	2	42	59.0	......	5, 22, 30	94	17	57	76.3	......
State Agr. College	8	93	2	41	59.2	3.59	3	91	7, 17	58	73.9	5.65
Le Roy	8, 9, 30	90	5	46	64.6	12.01	......	......	......	......	......	......
Council Grove	8	91	6	36	60.5	7.15	22	94	17	52	75.2	3.75
Averages	......	......	......	......	59.1	7.36	......	......	......	......	74.2	4.31
NEBRASKA.												
Elkhorn	3	84	2	34	54.9	......	22	94	17	54	71.3	......
De Soto	3	83	1	30	55.9	8.20	22	94	17	51	72.5	5.48
Bellevue	3	81	1, 6	37	55.7	5.38	22, 23	86	17	49	73.3	2.91
Glendale	3	85	5, 6	35	55.3	8.25	22	92	17	52	72.3	3.15
Peru	......	......	......	......	......	......	22, 30	90	17	54	73.7	......
Averages	......	......	......	......	55.5	7.28	......	......	......	......	72.6	3.85

Meteorology of 1867—Continued.

Stations in States and Territories.	MAY. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	JUNE. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
UTAH TERRITORY.												
		Deg.		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
Gt. Salt Lake City	......	......	......	......	......	......	29, 30	91	6, 7	42	67.5	1.47
Wanship	9, 14	79	4	36	53.2	......	27, 29	93	6	37	64.2	......
Averages	......	......	......	......	......	......	......	......	......	......	65.6	1.47
CALIFORNIA.												
San Francisco	31	93	18	49	63.6	0.00	10	95	3, 19, 28	61	75.1	0.00
Monterey	31	80	29	46	57.8	0.21	9	83	6, 7	45	......	0.00
Averages	......	......	......	......	63.2	0.11	......	......	......	......	75.1	0.00
OREGON.												
Albany	31	85	4	34	60.6	2.45	25	90	5	48	65.5	0.90
Corvallis	30	85	3	44	......	......	25	88	5, 6, 7	46	......	......

Stations in States and Territories.	JULY. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	AUGUST. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
MAINE.												
Steuben	3, 16	84	31	49	64.5	5.60	21	86	31	50	66.4	8.80
Lee	16, 24	86	27	50	66.5	3.55	8	87	31	52	65.7	5.10
Williamsburg	15, 16, 24	82	21, 26	52	64.7	8.41	......	......	......	......	......	......
West Waterville	24	90	19, 20	52	68.2	3.70	18	86	31	51	70.3	6.90
Gardiner	24	86	20, 21	55	67.1	3.94	18	81	31	54	68.2	8.49
Lisbon	24	88	......	......	......	4.08	......	......	......	......	......	7.76
Standish	24, 25	89	31	50	68.9	5.17	10	89	30, 31	53	69.9	9.10
Rumford Point	24	87	31	50	66.2	6.90	18	86	31	45	67.5	5.10
Cornish	24	88	21	52	67.6	4.10	7, 14	86	31	46	68.5	9.00
Cornishville	24	88	21	53	69.2	4.90	8	84	31	48	69.5	9.13
Averages	......	......	......	......	67.0	5.04	......	......	......	......	68.3	7.71
NEW HAMPSHIRE.												
Portsmouth	3	87	2, 15, 21, 31	56	67.0	6.80	10	85	31	49	59.0	3.50
Stratford	24	90	31	47	64.6	4.76	8	88	31	41	[illegible]	5.46
North Barnstead	24	88	31	54	68.8	4.24	5, 7, 18	86	30	52	69.1	7.86
Claremont	24	90	31	50	67.6	4.70	9, 18	86	31	42	68.4	5.87
Averages	......	......	......	......	67.0	5.13	......	......	......	......	64.1	5.67
VERMONT.												
Lunenburg	23	92	13, 14, 15, 16, 17	50	70.2	3.33	18	95	30	30	64.7	4.56
North Craftsbury	24	87	30, 31	48	63.9	4.85	8	92	31	42	......	......
Randolph	24	89	14, 22	49	66.4	3.30	7	88	31	48	67.7	4.90
Middlebury	28	84	13	54	64.2	3.11	8	80	31	48	68.3	4.25
Brandon	28	92	19	51	68.2	4.43	......	......	......	......	......	......
Barnet	24	100	11	61	74.0	3.00	......	......	......	......	......	......
Averages	......	......	......	......	67.8	3.67	......	......	......	......	66.9	4.57
MASSACHUSETTS.												
Kingston	4	88	13	55	68.1	7.25	18	88	31	59	70.1	8.65
Topsfield	4	92	19, 20, 21	57	70.1	6.39	18	90	31	55	71.3	9.21
Lawrence	4	88	20, 21	54	67.8	7.40	18	85	31	48	69.1	......
Georgetown	24	88	13, 21	54	67.2	......	5, 8	85	31	45	69.0	......
Newbury	28	91	21	55	69.0	......	6, 10	90	31	50	69.7	......

Meteorology of 1867—Continued.

Stations in States and Territories.	JULY. Date.	JULY. Maximum temperature.	JULY. Date.	JULY. Minimum temperature.	JULY. Mean temperature.	JULY. Rain or melted snow.	AUGUST. Date.	AUGUST. Maximum temperature.	AUGUST. Date.	AUGUST. Minimum temperature.	AUGUST. Mean temperature.	AUGUST. Rain or melted snow.
MASS.—Continued.		Deg.		Deg.	Deg.	In.		Deg.		Deg.	Deg.	In.
Milton	4	94	21	53	67.9	5.13	18	88	31	46	69.4	8.75
North Billerica	25	89	21	54	70.6	......	7, 10, 19	86	31	43	71.2	......
West Newton	4	99	1, 21	58	72.7	3.70	10, 18	94	31	54	75.2	10.15
New Bedford	25	82	21	55	67.7	5.92	15, 18	81	31	53	70.6	5.56
Do	7	89	21	57	70.2	6.11	15	84	31	54	72.1	6.42
Worcester	4	88	21	55	69.0	3.36	18	84	31	51	69.4	10.79
Mendon	4	88	21	54	68.2	3.20	18	85	31	50	66.4	8.75
Lunenburg	25	90	21	55	73.3	3.60	7, 9, 14	86	31	49	69.2	10.80
Amherst	3, 24	86	31	55	68.1	4.00	7	84	31	48	68.6	9.16
Richmond	3, 15, 27	90	30	57	72.8	7.35	18	90	31	44	72.4	8.82
Williams College	28	87	14, 19	52	66.2	3.61	18	85	31	45	67.4	5.21
Averages	......	......	......	......	69.3	5.16	......	......	......	......	70.1	8.52
RHODE ISLAND.												
Newport	1	88	21	58	67.4	6.63	6, 15	86	31	52	7.00	6.70
CONNECTICUT.												
Pomfret	4	85	21	53	66.6	3.16	18	81	31	50	67.3	12.13
Groton	......	......	......	......	......	......	10, 19	86	31	52	......	10.75
Columbia	4	92	18	58	70.5	......	7, 18	88	31	48	70.6	......
Middletown	4	94	13, 19	58	70.8	3.31	5, 18	89	31	48	70.7	10.22
Colebrook	4, 24	88	21	54	68.3	......	5	84	30	51	68.4	......
Averages	......	......	......	......	69.1	3.24	......	......	......	......	69.3	11.03
NEW YORK.												
Moriches	1	92	9, 19, 20, 21	64	74.4	4.65	11	90	31	56	75.1	5.60
South Hartford	24	92	1, 5, 13	56	72.5	3.73	7, 15, 18	86	30	46	73.4	2.50
Troy	24	93	31	57	71.6	3.42	18	88	31	51	71.7	7.29
Germantown	24	95	13	58	73.2	1.80	5, 18	90	31	56	76.0	5.80
Garrison's	4	94	19	57	71.0	4.20	18	89	31	51	71.0	10.75
Throg's Neck	3, 4, 7	90	9	60	72.6	......	18, 21	86	30	58	73.0	......
White Plains	4	85	16	55	69.9	......	18	82	30	56	70.8	......
Deaf and Dumb In.	4	88	13, 20	61	72.3	5.76	18	85	31	54	71.9	7.70
Columbia College	4	90	18	60	74.1	3.88	18	85	30	61	72.6	6.72
Flatbush	14	92	18	58	70.8	2.57	12	90	31	55	72.2	8.63
Newburgh	4	93	18	58	72.3	3.11	18	89	31	52	72.0	9.23
Minaville	24	86	18	59	70.4	......	7	84	30	54	69.7	......
Gouverneur	24	88	18, 30	54	66.4	2.52	7	88	30	48	68.5	1.99
North Hammond	24	88	9, 13, 18	56	68.7	4.17	9	93	30	54	72.1	3.45
Houseville	28	90	13	50	67.3	4.12	6, 7	89	30	48	68.1	3.33
South Trenton	28	90	10, 13, 21	54	69.8	0.86	5	90	31	42	70.4	3.34
Cazenovia	28	87	19	53	67.6	......	18	87	30, 31	48	68.8	......
Oneida	28	92	13	54	69.6	5.96	7	91	30	48	70.1	5.15
Depauville	24	86	13	55	68.2	2.18	6, 7, 8, 9	88	30, 31	52	70.1	2.05
Oswego	28	90	9, 13, 14	56	67.2	1.94	18	87	31	52	69.8	2.53
Palermo	24, 28	94	13	51	69.3	2.40	6, 7, 8, 9, 18	90	30	46	69.5	1.60
Nichols	24	95	15, 31	50	69.3	......	6	95	31	44	69.6	......
Geneva	24	94	13	55	70.9	2.64	18	93	30	50	69.0	0.96
Rochester	24	90	9, 13, 14	56	69.2	3.54	18	91	30	49	71.2	0.72
Rochester Univer'y	24	89	9	56	69.4	3.56	18	90	31	49	69.6	0.72
Little Genesee	24	93	14, 17	48	67.4	3.30	6	91	31	37	66.7	4.00
Friendship	24	90	17	51	67.1	2.45	6	88	30, 31	43	66.3	1.42
Suspension Bridge	23	100	14	54	70.5	......	6, 8	96	30	46	69.9	......
Buffalo	27	90	13	54	71.8	1.54	7	94	30	50	72.2	0.29
Averages	......	......	......	......	70.0	3.14	......	......	......	......	70.7	4.16
NEW JERSEY.												
Paterson	4, 28	94	9, 15, 18	60	71.7	4.85	6, 14	90	31	48	71.0	13.46
Newark	4, 25	88	19	56	70.9	3.76	18, 19	84	31	50	70.8	10.62
New Brunswick	4	90	19	58	71.9	5.03	18	87	31	55	71.3	8.45

Meteorology of 1867—Continued.

Stations in States and Territories.	JULY. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	AUGUST. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
NEW JERSEY—C'd.		Deg.		Deg.	Deg.	In.		Deg.		Deg.	Deg.	In.
Trenton	4	92	10	63	77.5	6.55	19	86	31	58	75.7	9.58
Burlington	4, 28	88	16, 19	62	72.8	5.80	19	86	31	55	71.3	10.50
Moorestown	......	......	......	......	......	......	19	86	31	56	72.1	8.86
Mount Holly	4	89	19	60	71.7	......	19	83	31	51	71.6	......
Seaville	3	95	15, 20, 21, 22	62	72.3	6.20	19, 20	90	1, 31	62	76.6	7.60
Dover	4	89	13	56	70.7	5.83	14	88	30	53	71.4	11.46
Readington	4	92	13, 14, 15, 17, 19, 22	60	73.9	......	5, 14	88	......	......	......	......
Haddonfield	4	92	15	58	72.4	4.18	10, 19	85	31	51	71.3	13.42
Greenwich	28	91	15	59	74.8	2.30	14, 19	87	31	53	73.7	8.77
Vineland	......	......	......	......	......	......	14	91	30, 31	56	74.1	8.52
Averages	......	......	......	......	72.8	4.94	......	......	......	......	72.6	10.11
PENNSYLVANIA.												
Nyces	24	90	18	51	68.4	2.90	14	85	30	43	67.0	9.60
Fallsington	3, 4	90	18	60	71.9	5.30	19	85	31	56	71.0	11.00
Philadelphia	4	91	19	62	76.1	3.03	5, 14	85	31	62	74.6	16.84
Germantown	4, 5	93	19	58	74.4	......	14	89	31	60	73.4	......
Horsham	4	88	9	59	71.7	3.16	10, 14	84	31	54	70.4	14.80
Dyberry	24	91	14	48	66.9	......	18	85	31	40	65.5	......
Lehigh University	1, 4	89	15	57	71.2	......	10, 14, 18	85	31	46	69.8	......
Whitehall	4	88	15	52	71.6	......	14	86	31	45	70.5	......
Parkesville	3	93	31	61	75.1	3.65	14	90	30	58	74.0	9.68
Reading	4, 5, 24	93	31	59	73.9	......	18	89	31	58	72.5	......
Ephrata	24	95	9, 15	61	75.4	3.02	14, 18	90	31	56	73.8	14.86
Silver Spring	4	96	9	48	74.0	......	......	......	......	......	......	......
Mount Joy	4	94	13, 19	62	72.8	2.15	18	90	30	57	73.2	8.80
Harrisburg	4	90	14	65	76.0	2.55	13, 19	85	31	56	73.4	14.17
Tioga	3, 4, 27	96	31	50	71.5	3.25	18	89	31	49	71.0	9.79
Lewisburg	24	92	9	59	73.0	2.73	18	88	31	47	70.9	8.74
Ickesburg	4	94	31	57	72.5	3.24	8	96	30	48	71.4	4.60
Murrysville	24	92	9, 10	55	73.0	3.88	......	......	......	......	......	......
Grampian Hills	24	92	11, 17	50	67.9	4.21	6	89	31	42	67.3	4.24
Connellsville	24	92	9	55	71.7	......	6, 18, 19	88	30	48	71.0	......
New Castle	24	93	10	45	69.8	......	18	90	31	47	69.7	......
Canonsburg	24	92	10	52	71.1	3.60	18	90	31	42	71.0	1.84
Averages	......	......	......	......	72.3	3.33	......	......	......	......	71.1	9.92
MARYLAND.												
Woodlawn	28	93	8	61	75.3	3.31	14	90	30	57	73.3	11.38
Catonsville	28	89	10	61	74.2	......	18, 19	85	30, 31	58	71.6	......
Annapolis	28	92	10	64	77.2	4.44	18	88	30, 31	63	75.8	14.55
Emmittsburg	24	96	13	60	75.3	......	5	95	31	54	74.5	......
Averages	......	......	......	......	75.5	3.88	......	......	......	......	73.8	12.97
VIRGINIA.												
Surry C. H.	24, 25	99	19	63	76.7	......	20	96	31	62	79.4	......
Cape Charles L. H.	1, 26	90	13, 15	65	76.8	4.20	20	87	31	69	74.1	5.10
Hewlett's Station	1, 24, 28	92	19	59	75.3	2.75	13	91	30	64	75.0	6.57
Mount Solon	1	94	30	60	75.9	......	13	91	31	50	72.7	......
Lynchburg	25	90	31	62	76.6	......	19	86	31	55	74.5	......
Averages	......	......	......	......	76.3	3.48	......	......	......	......	75.1	5.84
WEST VIRGINIA.												
Romney	3	94	14	54	72.0	......	13	94	31	52	73.5	......
Grafton	3	100	10	56	77.2	5.60	9	98	31	45	77.5	5.20
Cabell C. H.	1, 2, 3	91	10	58	75.0	1.60	12	92	31	54	74.2	2.50
Averages	......	......	......	......	74.7	3.60	......	......	......	......	75.1	3.85

Meteorology of 1867—Continued.

Stations in States and Territories.	JULY.						AUGUST.					
	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
NORTH CAROLINA.		*Deg.*		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
Goldsboro'	25	98	21	67	79.1	9.00	19	90	31	64	77.3	9.78
Raleigh	25	103	10, 15, 20	65	79.7	2.45	14	97	31	61	78.1	6.85
Oxford	25, 26	92	31	64	81.7	1.80	21	89	31	61	76.3	4.45
Albemarle	2, 24	97	21	59	77.0	1.43	14	93	30, 31	60	75.6	8.70
Statesville	25	94	21	55	75.2	0.25	11, 13, 14, 18, 19, 20, 24, 25	86	30, 31	54	73.8	5.25
Asheville	25	88	10, 22	60	73.2	......	13	87	31	55	70.5	......
Averages	......	......	......	......	77.7	2.99	......	......	......	......	75.3	7.01
SOUTH CAROLINA.												
Aiken	24	93	14, 15, 16, 20	71	79.7	......	20	86	31	65	75.5	11.07
ALABAMA.												
Opelika	24, 25	94	2	72	80.5	......	16	90	31	68	75.8	......
Carlowville	25	94	1, 5, 11, 12, 13	75	81.9	2.26	19	95	25, 31	70	81.2	1.45
Moulton	25, 26	86	22, 23	64	76.6	5.55	5	86	30	61	78.4	4.96
Prairie Bluff	24, 25	97	1	74	82.9	......	14	97	28, 31	70	83.0	......
Havana	24, 25	94	1, 7, 8	72	80.0	5.00	......	......	......	......	......	......
Fish River	22	93	1, 17	73	81.0	2.82	6, 8, 13, 14, 15, 16	90	31	68	78.1	13.55
Averages	......	......	......	......	80.5	3.91	......	......	......	......	79.3	6.65
FLORIDA.												
Fernandina	5, 6	89	29	71	82.6	5.40	......	......	......	......	......	......
Jacksonville	28	98	17	74	86.1	11.08	28	94	31	75	81.9	6.40
Port Orange	5	93	11	74	85.4	......	2	90	17	74	......	......
Gordon	26, 27, 31	94	29	72	82.2	......	......	......	......	......	......	......
Cedar Keys	2	95	17, 19	77	84.0	......	......	......	......	......	......	......
Averages	......	......	......	......	84.1	8.24	......	......	......	......	81.9	6.40
TEXAS..												
Houston	24	98	2	73	84.6	......	......	......	......	......	......	......
Columbia	23, 27	96	6	75	83.1	5.33	13	96	17, 18, 21	73	81.7	8.23
Waco	22, 28	99	2	74	85.7	2.30	12, 13, 19, 23, 25	97	17, 18	71	84.3	4.00
Austin	28, 31	97	2	71	83.6	......	14	98	29, 30	72	82.6	3.27
Long Point	......	......	......	......	......	......	15	99	28, 29	72	84.9	11.63
Averages	......	......	......	......	84.3	3.82	......	......	......	......	83.4	6.78
LOUISIANA.												
Benton	21, 28	92	2	72	83.3	......	......	......	......	......	......	......
MISSISSIPPI.												
Grenada	24, 25	91	31	64	......	......	12, 13	94	31	61	......	......
Fayette	20, 23 24. 25	84	31	67	75.5	......	26	88	31	65	76.0	......
Natchez	20, 21, 22, 23, 25	88	31	70	81.7	8.16	7, 14	89	31	65	78.8	4.00
Averages	......	......	......	......	78.6	8.16	......	......	......	......	77.4	4.00
TENNESSEE.												
Tusculum College	25	89	9	63	75.5	......	11, 12	88	31	57	74.0	......
Lookout Mountain	25	91	15	69	77.5	......	13	89	2	67	77.9	......
Clarksville	11, 25	89	30	63	74.7	4.05	18, 26	88	30	58	74.5	1.30
Franklin	11	88	21	68	77.1	......	12	93	30	60	77.7	......
Averages	......	......	......	......	76.2	4.05	......	......	......	......	76.0	1.30

Meteorology of 1867—Continued.

Stations in States and Territories.	JULY.						AUGUST.					
	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
KENTUCKY.		*Deg.*		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
Chilesburg	2	94	10	54	75.0	5.83	12, 13	96	31	50	......	1.26
Lexington	2	89	31	57	73.0	5.78	12	90	30	53	71.0	5.42
Louisville	24	94	10	53	75.4	3.53	18	95	30	50	76.1	1.92
Averages	......	......	......	......	74.5	5.05	......	......	......	......	73.6	2.87
OHIO.												
New Lisbon	24	100	12, 20	50	72.4	3.13	6	94	31	45	......	......
Steubenville	24	93	17	54	76.7	3.65	18	91	31	48	75.4	2.65
Painesville	24	87	13, 29	59	70.6	5.19	18	86	30	52	70.6	1.75
Milnersville	3	93	30	50	73.0	2.79	19	93	30, 31	48	70.0	2.23
Cleveland	11, 28	91	9	54	71.5	2.72	18	91	30	51	71.1	0.88
Do	4	92	9, 10	63	77.7		......	......	......	......	......	......
Wooster	24	96	9, 16, 17	60	75.9	......	6	94	31	48	75.0	......
Kelley's Island	24	89	12	61	74.0	3.63	18	89	30	57	74.9	0.14
Norwalk	2, 3, 28	90	12, 17	54	70.9	2.89	18	93	30	59	70.7	0.41
Carson	3, 23	90	13, 16, 19	58	73.0	1.78	18	98	30	50	72.0	0.71
North Fairfield	3, 5, 24	90	9, 10, 12, 13, 17	60	73.5	2.12	18	91	30	51	74.0	0.97
Marion	2, 3	89	30	59	72.0	3.14	12	89	30	48	71.3	1.40
Hillsboro'	1, 2	90	13	58	73.3	2.56	17	88	30	50	71.6	4.02
Toledo	23	94	13	48	71.8	2.06	9	92	30	48	71.8	2.44
Bowling Green	24	99	30	46	72.2	4.72	6	98	30	36	69.9	5.70
Kenton	28	94	13	64	77.2	2.56	18	94	30	50	76.9	1.31
Urbana University	1	94	30	57	73.9	2.87	8, 18	93	30	48	73.1	2.08
Bethel	3	94	9, 12, 13, 16, 20, 21, 29, 30	60	72.5	2.35	18	92	30	53	75.2	2.25
Cincinnati	24	95	17	63	76.4	1.60	9, 18	93	30	58	76.1	1.58
Do	7	96	16	64	79.4	2.38	9, 19	95	30	60	81.6	0.81
College Hill	24	97	16, 17, 18	60	76.0	0.94	13	95	26	62	77.3	0.44
Farm School	1	95	9	56	74.6	2.25	......	......	......	......	......	......
Averages	......	......	......	......	72.2	2.77	......	......	......	......	73.6	1.77
MICHIGAN.												
Monroe City	24	94	10	50	75.8	1.80	17	92	30	48	74.7	2.70
State Agr'l College	23	94	12	52	71.6	1.78	5, 12, 23	90	30	38	69.8	1.74
Litchfield	23	95	12, 15, 16	56	71.7	3.83	17	89	30	48	70.0	3.60
Grand Rapids	23	94	9, 12	56	72.5	......	9	92	30	48	72.2	......
Northport	23	88	8	52	66.7	......	17	89	29	47	68.2	......
Holland	3	88	9, 12, 29	53	70.5	1.65	......	......	......	......	......	......
Otsego	24	96	7	54	72.7	......	7, 9, 12	94	28, 29, 30	50	72.4	......
Copper Falls	20, 22, 23	81	11	48	63.4	2.06	8	91	31	46	64.1	1.58
Ontonagon	22	84	6	54	66.1	......	8	88	31	44	66.3	......
Averages	......	......	......	......	70.1	2.22	......	......	......	......	69.7	2.41
INDIANA.												
Richmond	2	92	9	60	72.6	6.98	18	91	30	53	71.8	1.69
Aurora	2	100	31	56	77.5	2.59	7, 18	96	30	54	75.9	1.66
Vevay	24	100	29	62	80.3	3.95	24	98	30	52	80.2	4.09
Muncie	1, 3	98	9, 29	59	76.0	3.90	9	95	30	49	72.3	5.30
Spiceland	2	97	9	58	74.3	5.20	18	94	30	53	73.3	1.50
Columbia City	22, 23, 24	93	15	54	73.8	0.13	9	92	31	49	71.2	3.63
Merom	1	93	8	61	75.1	4.50	18	94	29	56	75.9	2.30
New Harmony	1, 2, 11	91	30	66	77.8	3.62	12, 19	92	30	63	77.9	1.76
Averages	......	......	......	......	75.9	3.86	......	......	......	......	74.8	2.74
ILLINOIS.												
Chicago	22, 23, 25	86	9, 12	62	72.9	1.52	12	102	29	54	78.2	......
Near Chicago	24	100	29	58	77.4	......	17	89	30	57	75.5	2.33
Golconda	27	100	15	61	81.7	4.49	4, 10, 19	99	2	62	77.4	1.10
Aurora	2, 23	89	12	54	72.2	2.98	8	92	29	52	71.8	2.79

Meteorology of 1867—Continued.

Stations in States and Territories.	JULY.						AUGUST.					
	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
ILLINOIS—Con'd.		*Deg.*		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
Sandwich	3	95	12	55	72.9	1.95	12	97	30	50	72.3	2.98
Ottawa	2, 24	97	12	57	73.6	4.23	9	100	29	56	76.3	2.41
Winnebago	23	93	13, 29	57	72.2	1.58	7, 8	94	29	49	71.8	3.33
Rochelle	23	96	12, 16	59	73.4	......	12	97	29	50	74.0	......
Wyanet	22	94	13	57	75.6	1.95	9	96	30	52	75.8	2.48
Tiskilwa	3, 23	94	13	54	72.6	......	5, 8	92	30	48	72.5	......
Hennepin	......	......	......	......	......	......	8	95	11	50	72.0	......
Elmira	2	93	13	60	75.3	1.77	12	94	30	53	74.9	2.80
Peoria	21	95	13	62	76.2	2.65	12	93	29	55	75.6	2.26
Springfield	25	98	12	56	75.2	......	9	98	28	56	75.8	......
Loami	24	96	29	62	77.1	1.55	17	99	29	58	77.5	2.50
Dubois	23	94	9, 30	57	76.4	5.55	9	97	30	58	78.5	2.60
Waterloo	24	98	13, 29, 30	70	83.2	......	12	97	30	63	81.9	......
South Pass	11	95	29, 30	64	78.5	......	10, 11, 25	98	29	63	79.8	......
Galesburg	2	89	12, 13	61	......	......	12	92	30	53	72.5	3.21
Manchester	24	95	30	63	76.8	2.83	12	97	30	61	77.4	2.50
Mount Sterling	3	94	15	66	......	......	12, 18	96	29	62	80.2	......
Andalusia	23	91	16, 18	57	75.5	......	7, 8, 17	90	30	50	75.7	......
Augusta	24	89	16	62	77.4	3.70	12	91	28, 29, 30	58	77.9	1.86
Averages	......	......	......	......	75.8	2.82	......	......	......	......	75.9	2.51
WISCONSIN.												
Manitowoc	22	93	12, 13	50	68.3	4.32	17	94	30	44	67.8	1.52
Plymouth	23	96	12	48	71.8	3.20	7	96	29, 30	45	71.0	3.30
Milwaukee	22	91	13	46	69.2	2.60	9	94	30	43	70.2	2.01
Do	22, 23	86	12	54	69.5	2.97	17	92	30	50	70.9	2.26
Geneva	23	93	8, 12	59	73.2	......	8, 9	94	30	48	73.1	......
Delavan	3, 23	87	12	50	70.2	2.33	8	92	30	47	70.4	2.00
Waupacca	22	91	8, 12, 13	60	73.0	......	8	93	29	45	72.5	......
Do	22, 23	94	12	53	69.8	7.10	17	93	30	44	70.3	2.70
Embarras	20, 22	94	16	46	67.4	3.56	8	95	30	42	68.1	1.64
Rocky Run	23	92	12	56	71.1	4.39	7, 8	92	29, 30	52	71.2	2.69
Beloit	23	92	12	55	71.5	2.69	......	......	......	......	......	......
Edgerton	2	100	9	55	73.0	6.18	7	101	30	42	73.1	4.00
Baraboo	3	90	......	......	......	......	7	90	30	42	71.9	1.81
New Lisbon	23	98	8, 29	52	72.4	......	......	......	......	......	......	......
Galesville	22	84	......	......	......	......	7	88	30	47	71.2	......
Averages	......	......	......	......	70.8	3.92	......	......	......	......	70.9	2.39
MINNESOTA.												
Beaver Bay	27	88	18	51	65.2	7.15	6	85	31	41	66.7	3.34
Grand Portage	24	78	13, 17, 31	48	59.6	......	20	75	30	41	59.8	......
Red Wing	3	91	8	53	70.8	4.54	21	98	29	50	74.1	3.08
St. Paul	10	83	6, 8	56	68.4	3.83	7	86	29, 30, 31	48	68.3	2.32
Minneapolis	3	84	6, 8	53	67.6	5.46	16, 21	85	31	48	70.0	2.73
Sibley	3, 26	92	28	56	71.1	5.12	7	94	28	46	71.3	......
New Ulm	3, 22	90	6	55	74.5	4.40	21	94	31	50	75.2	0.11
Averages	......	......	......	......	68.2	5.08	......	......	......	......	67.3	2.32
IOWA.												
Clinton	2, 22	95	13	60	75.3	2.00	7, 8	95	29	52	76.1	4.25
Davenport	24	90	13	60	71.3	5.44	9	90	30	56	74.5	2.80
Dubuque	2, 22	91	13, 16	58	73.8	4.86	16	91	30	49	74.3	2.28
Monticello	2	92	13, 16	59	71.9	4.30	17	92	30	48	71.9	3.37
Fort Madison	22, 27	93	20	61	75.1	2.59	12	99	29	54	77.2	2.44
Guttenberg	2, 22, 23, 26, 27	90	13	53	70.2	......	7	96	30	42	69.3	......
Ceres	23	95	16	50	74.1	......	8, 16	94	30	44	75.5	......
Mount Vernon	2	95	29	56	72.9	......	7, 16, 17	91	28	49	72.1	......
Iowa city	24	92	16	55	73.4	6.24	18	95	28, 29	50	74.7	4.45
Independence	27	91	15	59	73.1	3.70	17	98	29	47	74.3	3.50
Near Independence	23, 24	99	15	55	77.5	4.50	15	96	29	50	71.4	2.20
Waterloo	24	92	16	50	71.6	......	22	96	28, 29	50	74.0	......

Meteorology of 1867—Continued.

Stations in States and Territories.	JULY.						AUGUST.					
	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
IOWA—Contin'd.												
		Deg.		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
Marble Rock	2	88	7	58	70. 9	......	7	87	30	52	71. 6	1. 40
Iowa Falls	24	92	15, 20	58	76. 3	4. 30	15	94	28	52	73. 1	4. 29
Algona	2, 3	90	11	57	72. 4	......	16	90	28, 30	54	72. 3	......
Do	2, 3, 22	86	12	59	72. 1	......	6	92	27, 30	53	71. 8	......
Dakota	23	94	7	45	71. 2	......	16	92	28	44	70. 7	......
Fort Dodge	24	93	12, 29	57	73. 3	5. 57	6, 18	92	29	52	73. 4	2. 05
Fontanelle	10, 27	92	9	43	72. 8	5. 13	13	95	28, 30	58	74. 4	7. 75
Logan	24	90	29	49	70. 2	3. 80	16, 17	90	28	48	72. 5	2. 00
Averages	....	......	....	......	72. 7	4. 37	....	......	....	......	73. 3	3. 29
MISSOURI.												
St. Louis	3	92	16	65	78. 8	2. 47	12	98	29, 30	63	79. 4	2. 29
St. Louis University	....	......	....	......	......	......	12	95	30	63	79. 2	1. 49
Allenton	24	101	30	56	75. 5	2. 95	18	103	29	50	76. 5	2. 25
Canton	1	92	29	68	79. 8	0. 75	16, 17	94	29	62	78. 0	0. 35
Rolla	1	91	17, 30	55	73. 4	6. 62	12	95	22	51	73. 5	1. 25
Harrisonville	27	92	12, 15	62	74. 7	7. 40	10, 11, 25	92	28	60	75. 7	2. 80
Oregon	27	94	7	63	76. 6	12. 24	7, 11, 12, 20	92	28	60	77. 5	2. 95
Averages	....	......	....	......	76. 5	5. 41	....	......	....	......	77. 1	1. 91
KANSAS.												
Leavenworth	25	102	20	56	75. 0	6. 39	23	97	29	47	78. 5	0. 50
Olatha	1, 23, 24, 27	98	12, 15	60	76. 6	6. 70	9	98	28	59	78. 2	2. 80
Baxter Springs	6	98	6, 8, 16, 29	68	82. 0	4. 71	10	100	29	57	80. 0	1. 85
Atchison	1, 27	100	7, 20	62	76. 6	3. 60	12	100	29	54	76. 2	0. 00
Holton	1	97	15	61	77. 3	......	6, 10	95	28	58	78. 3	......
State Agr. College	23	95	15	62	75. 7	5. 42	11, 19	94	28	59	77. 6	0. 70
Council Grove	27	95	16	58	78. 0	11. 35	23	97	30	50	78. 7	0. 00
Averages	....	......	....	......	77. 3	6. 36	....	......	....	......	78. 2	0. 98
NEBRASKA.												
Elkhorn	23	95	7	58	73. 7	......	17	96	28	53	74. 1	......
De Soto	24	95	7	56	75. 2	3. 50	17	101	28	57	74. 7	1. 39
Glendale	9	96	12	57	75. 3	4. 70	17	97	28	56	75. 1	1. 70
Omaha Agency	....	......	....	......	......	......	16	100	1	60	77. 4	......
Averages	....	......	....	......	74. 7	4. 10	....	......	....	......	75. 3	1. 55
UTAH TERRITORY.												
Gt. Salt Lake City	1	91	17, 18, 19	60	72. 2	2. 61	1, 2, 17, 18, 20	90	17, 31	66	77. 0	0. 94
Wanship	9	97	17	50	73. 2	......	7, 21	95	13	60	75. 1	......
Averages	....	......	....	......	72. 7	2. 61	....	......	....	......	71. 1	0. 94
CALIFORNIA.												
San Francisco	30	103	25	64	82. 1	0. 00	....	......	....	......	......	......
Marsh Ranch	....	......	....	......	......	......	25	102	13	61	77. 2	0. 00
Monterey	7	93	10, 18, 27	49	......	0. 00	8	78	7, 14	51	63. 2	0. 00
Averages	....	......	....	......	82. 1	0. 00	....	......	....	......	70. 2	0. 00
OREGON.												
Albany	31	101	23	52	69. 0	0. 36	27	100	6, 7, 10, 29	60	73. 0	0. 00
Corvallis	7, 11	88	23	50	......	......	1	99	19, 20, 31	56	......	......

Meteorology of 1867—Continued.

Stations in States and Territories.	SEPTEMBER. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	OCTOBER. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
MAINE.		*Deg.*		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
Steuben	19	74	19	30	55. 5	2. 60	16	98	5, 24	27	46. 1	7. 20
Lee	5	74	15	34	55. 1	0. 05	19	71	5	24	46. 8	3. 05
West Waterville	4	75	30	35	58. 2	0. 78	19	76	4	30	48. 4	5. 30
Gardiner	4	69	30	38	57. 1	0. 97	19	68	25	31	46. 4	4. 60
Standish	6	77	24	36	58. 4	2. 13	19	74	25	31	47. 5	2. 99
Rumford Point	6, 29	74	24	30	57. 6	0. 85	......	......	......	......	......	......
Cornish	5	76	24	34	57. 3	1. 26	19	74	24	27	46. 8	4. 25
Cornishville	20	74	30	33	58. 4	0. 92	19	74	23	32	48. 2	4. 62
Averages	......	......	......	......	57. 2	1. 20	......	......	......	......	47. 2	4. 57
NEW HAMPSHIRE.												
Portsmouth	11	75	25	39	59. 0	0. 16	17, 18	70	24	30	51. 0	......
Stratford	6	79	24	28	53. 0	3. 04	19	73	24	22	44. 2	3. 46
North Barnstead	2	78	30	38	61. 0	0. 88	19	74	23, 24	33	50. 0	2. 61
Claremont	18	80	15	33	58. 0	2. 10	19	75	24	25	48. 0	3. 70
Averages	......	......	......	......	57. 8	1. 55	......	......	......	......	48. 3	3. 26
VERMONT.												
Lunenburg	......	......	......	......	......	......	18, 19	70	2	22	55. 7	1. 50
North Craftsbury	18	81	24	28	55. 2	3. 56	19	68	24	25	44. 5	3. 42
Randolph	18	88	24	35	56. 5	1. 73	18	70	24	23	48. 6	4. 00
Middlebury	18	77	27	34	56. 7	2. 45	18	69	4	30	49. 0	3. 48
Averages	......	......	......	......	56. 1	2. 58	......	......	......	......	49. 5	3. 10
MASSACHUSETTS.												
Kingston	4, 6, 7, 10, 18, 19	76	30	38	61. 7	3. 25	19	80	25	32	52. 4	4. 25
Topsfield	4	78	30	42	61. 7	0. 50	19	77	24, 26	32	51. 6	6. 43
Lawrence	18	75	15	38	59. 2	0. 82	19	73	24	29	48. 3	4. 79
Georgetown	2	76	24, 30	40	......	......	19	78	25	32	51. 0	......
Newbury	13	81	24	37	59. 3	......	18, 19	75	24	29	49. 4	......
Milton	6, 13	78	30	38	59. 6	0. 50	19	78	25	28	51. 8	2. 74
North Billerica	18	80	24	36	60. 2	......	10	78	25, 26	30	49. 5	......
West Newton	2, 6, 7, 13, 18	82	30	40	61. 2	1. 10	18	83	24, 25	28	53. 0	4. 00
New Bedford	7, 17	74	30	40	61. 6	2. 42	19	74	24	33	53. 1	3. 91
Worcester	18	77	24, 30	40	61. 2	1. 97	18, 19	75	24	31	51. 4	3. 79
Mendon	4, 18, 20	76	24	34	60. 5	0. 90	18	74	24	30	49. 4	......
Lunenberg	13	78	24	39	59. 9	0. 82	19	77	24	31	50. 1	3. 45
Amherst	17	80	28	39	59. 9	1. 10	18	76	25	27	49. 9	3. 85
Richmond	......	......	......	......	......	......	18	76	24	26	52. 2	6. 12
Williams College	18	82	24	35	59. 2	1. 20	18	73	24	25	48. 9	1. 27
Averages	......	......	......	......	60. 4	1. 33	......	......	......	......	50. 7	4. 05
RHODE ISLAND.												
Newport	17	88	30	40	61. 1	2. 30	19	76	24	30	51. 5	4. 35
CONNECTICUT.												
Pomfret	18	75	30	38	58. 7	0. 77	19	75	24	32	49. 3	3. 21
Groton	17	86	24	44	55. 6	2. 22	20	78	25	30	54. 3	5. 01
Columbia	17	94	24	36	63. 8	......	18, 19	80	24, 25, 26	32	53. 4	......
Middletown	17	85	24	39	62. 8	2. 83	19	79	24	28	52. 4	4. 12
Colebrook	17, 18	82	30	35	60. 6	......	19	78	24	23	48. 6	......
Averages	......	......	......	......	60. 3	1. 94	......	......	......	......	51. 6	4. 11
NEW YORK.												
Moriches	17	88	24	45	68. 3	1. 50	19	84	25	35	57. 8	6. 82
South Hartford	18, 20	82	30	32	60. 3	1. 30	16	78	13, 23	28	53. 4	2. 72

Meteorology of 1867—Continued.

Stations in States and Territories.	SEPTEMBER. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	OCTOBER. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
NEW YORK—Con.		Deg.		Deg.	Deg.	In.		Deg.		Deg.	Deg.	In.
Troy	18	83	24, 30	41	62.1	0.15	18	77	24	32	51.6	3.20
Germantown	17	90	......	......	......	......	19	80	25	33	......	4.10
Garrison's	5	84	30	40	60.0	2.84	18	78	24, 25	33	52.0	4.26
Throg's Neck	5, 17	84	30	42	67.0	......	19	80	24	40	56.0	......
White Plains	5, 17, 19	80	30	43	64.3	......	19	74	24, 25, 26	37	52.1	......
Deaf and Dumb In.	19	83	30	43	64.2	......	19	76	24	39	54.3	5.12
Columbia College	17	83	30	44	64.3	......	19	75	2	32	53.1	2.11
St. Xavier College	17	84	30	45	64.0	1.00	19	77	24	38	54.2	4.47
Stapleton	......	......	......	......	......	......	2	87	25	38	57.5	3.83
Flatbush	19	83	29	46	68.1	1.08	2, 19	72	24	35	54.1	4.74
Newburgh	4, 13, 17, 18	80	30	42	62.1	1.87	18	81	24	37	54.5	5.86
Minaville	6, 17, 18	76	30	41	60.6	......	20	70	24	29	48.2	......
Gouverneur	18, 23	83	15	38	59.6	2.76	21	74	24	28	46.6	3.09
North Hammond	18	88	24	36	57.0	1.10	18	75	23	29	47.0	5.08
South Trenton	17, 18	88	27	32	60.4	5.18	21	76	1	26	46.9	3.84
Cazenovia	18	89	30	35	59.9	......	20	83	8	28	48.5	......
Oneida	18, 20	88	30	35	60.2	5.67	20	81	26	26	48.7	4.12
Houseville	18	86	30	32	56.0	2.48	20	80	1	30	48.2	6.80
Depauville	6	88	30	37	60.0	0.57	21	75	1	29	49.4	3.94
Oswego	18	84	23, 27, 30	42	60.0	2.19	17	75	4	33	49.3	1.28
Palermo	6	87	30	33	59.7	2.30	20	78	26	25	48.2	1.00
Nichols	6	84	30	35	49.1	2.69	19	81	27	24	49.2	......
Geneva	20	88	27	41	61.9	0.69	20	80	8, 24	33	52.2	1.50
Rochester	18, 20	85	30	35	60.5	2.28	19, 20	78	4, 8, 25, 26	32	51.0	1.92
Rochester Univers'y	18	86	30	36	60.5	2.28	19, 20	78	25	21	51.0	1.92
Little Genesee	18	86	30	31	51.4	2.02	20	80	26, 27	19	47.6	1.10
Friendship	18	86	30	30	58.1	2.81	......	......	......	......	......	......
Suspension Bridge	20	89	27	35	60.7	1.90	20	80	27	27	59.1	2.00
Buffalo	5	87	30	35	62.1	2.35	20	80	8	30	51.8	2.43
Averages	......	......	......	......	60.8	2.11	......	......	......	......	51.2	3.37
NEW JERSEY.												
Paterson	5	87	24	42	65.3	0.57	19	80	24	30	53.7	4.38
Newark	19	83	24, 27	44	64.3	1.23	19	75	25	35	53.9	4.62
New Brunswick	17	84	24	42	64.4	0.34	10	79	25	33	54.2	4.18
Trenton	19	83	15	50	65.0	3.47	20	74	25, 27	40	57.7	3.96
Burlington	19	82	27	45	65.1	1.40	19	79	25, 26	36	57.7	4.50
Moorestown	4, 17, 19	85	30	42	65.6	1.31	19	84	26	33	55.5	4.27
Mount Holly	17, 19	82	27	45	65.3	......	19, 20	77	25	33	55.0	......
Elwood	......	......	......	......	......	......	20	84	1, 24, 27	32	55.0	......
Seaville	17	90	28	40	64.3	2.00	19, 20	88	7, 8	36	56.6	4.60
Dover	17	81	30	41	62.4	0.01	19	78	24	29	52.4	4.60
Haddonfield	19	84	27	45	67.9	3.04	19, 20	78	25	36	55.4	4.60
Newfield	......	......	......	......	......	......	20	87	......	......	......	......
Greenwich	5, 18	86	27, 30	46	66.8	1.40	19	79	24, 25	37	55.8	2.37
Vineland	19	87	27	39	66.7	2.35	19	83	8, 25	32	55.0	3.73
Averages	......	......	......	......	65.3	1.56	......	......	......	......	55.2	4.16
PENNSYLVANIA.												
Nyces	17, 18	88	30	34	61.0	0.40	2	87	24	20	48.7	3.10
Fallsington	19	83	24, 27, 28	48	65.3	1.20	19	78	25, 26, 27	38	55.0	3.40
Philadelphia	19	86	30	46	67.8	1.85	19	80	8, 25	39	56.7	4.02
Germantown	4	87	30	44	67.2	......	19	82	24, 25	34	56.1	......
Horsham	17, 19	82	30	43	64.1	1.71	19	80	24, 25, 26	34	54.1	5.75
Dyberry	18	86	24	33	59.1	......	19	80	24, 25, 26	22	47.8	......
Lehigh University	19	84	24, 27	40	62.9	......	19, 20	76	25	29	52.3	......
Whitehall	19	82	24	39	63.1	......	18, 19	76	25, 26	28	52.1	......
Reading	19	88	27	42	65.0	......	18, 19	75	25	33	53.7	......
Parkesville	5, 6, 19	86	30	44	66.7	1.59	20	81	25	33	55.3	2.70
Ephrata	19	89	29, 30	50	68.4	1.25	20	83	24, 26	36	57.8	2.72
Mount Joy	19	95	27	44	67.3	......	20	81	25	32	56.1	4.50
Harrisburg	19	84	27, 30	49	66.8	2.47	19	76	25	37	55.2	3.14
Tioga	17, 18, 20	90	30	30	64.3	1.30	19	84	25	20	49.7	2.65

Meteorology of 1867—Continued.

Stations in States and Territories.	SEPTEMBER. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	OCTOBER. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
PENN.—Continued.												
		Deg.		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
Lewisburg	18	83	27	30	62.1	3.13	18	78	24	27	50.4	2.78
Ickesburg	18, 19	90	30	37	64.1	2.23	18, 19	85	25	26	52.7	4.93
Grampian Hills	18, 20	86	27	31	59.4	1.50	20	77	24, 25, 26	22	46.7	2.89
Connellsville	16, 20	92	30	36	65.0	......	2	80	24	26	51.6	......
Newcastle	20	90	27	38	65.0	......	19, 20	81	1, 24	32	54.5	......
Canonsburg	17, 20	92	12	38	64.9	1.15	19	89	24, 25	24	52.1	2.85
Averages	......	......	......	......	64.5	1.65	......	......	......	......	52.9	3.49
MARYLAND.												
Woodlawn	18	87	27	43	67.1	1.41	19, 20	85	8	38	55.9	4.30
Catonsville	19	82	30	48	66.0	......	19	78	24	36	55.1	......
Annapolis	5, 19	86	27, 30	50	70.3	1.91	18, 19	78	25	36	57.5	5.52
St. Inigoes	20	91	30	51	72.5	1.33	18	25	26	42	60.6	4.22
Emmittsburg	19	94	30	40	67.9	......	19	88	25	24	55.7	......
Mt. St. Mary's Coll.	19, 20	82	30	44	64.4	1.36	19	77	25	35	53.7	......
Averages	......	......	......	......	68.0	1.50	......	......	......	......	56.4	4.68
VIRGINIA.												
Surry C. H	20	96	30	46	75.1	0.00	3	89	31	40	60.5	......
Cape Chas. Lt'house	19	96	30	59	74.7	3.98	19	83	24	46	64.0	2.62
Hewlett's Station	20	93	30	47	71.0	0.57	......	......	......	......	......	......
Mount Solon	20	92	12	50	70.3	......	......	......	......	......	......	......
Lynchburg	19	86	25	55	......	......	3	77	25, 31	36	57.8	......
Snowville	9, 17	86	30	38	65.5	6.00	3	83	25	16	49.5	15.88
Averages	......	......	......	......	71.3	2.59	......	......	......	......	57.9	9.25
WEST VIRGINIA.												
Romney	18, 20	92	11, 24, 30	48	68.0	......	2, 19	86	24, 25	30	56.2	......
Grafton	18	96	27, 28, 30	45	71.3	0.75	2	88	24, 25	32	57.5	4.80
Cabell C. H	17, 19, 25	88	11, 22	52	73.2	0.10	19, 20	78	24	34	55.3	3.70
Averages	......	......	......	......	70.8	0.43	......	......	......	......	56.3	4.25
NORTH CAROLINA.												
Goldsboro'	21	91	30	58	74.0	8.74	3	90	29	40	61.5	4.75
Raleigh	19	94	30	50	73.1	1.70	3	89	24	38	57.8	4.50
Oxford	19	86	11, 25	60	72.3	10.00	3	81	24, 25	38	59.1	6.80
Albemarle	19	95	25, 30	53	71.9	4.80	3	89	8	35	57.6	8.58
Statesville	19, 20	90	24	50	67.0	2.00	3	84	25	28	53.4	4.63
Asheville	19	86	27	53	68.2	......	3	81	31	31	54.0	......
Averages	......	......	......	......	71.1	5.45	......	......	......	......	57.2	5.85
SOUTH CAROLINA.												
Aiken	20	90	1	64	73.0	4.26	3	85	31	42	61.3	4.27
Gowdysville	20	89	25	59	73.1	......	3	83	31	38	59.6	......
Averages	......	......	......	......	73.1	4.26	......	......	......	......	60.5	4.27
ALABAMA.												
Opelika	20	88	1, 25	68	76.1	......	1	83	31	44	64.6	......
Carlowville	20	90	30	68	77.7	3.72	1	88	31	43	64.3	2.87
Moulton	19	86	4	60	72.6	1.10	2	82	13	41	59.7	1.41
Prairie Bluff	14	96	11, 16, 23, 25, 28, 29	72	79.6	......	21, 22	86	31	40	68.8	......
Greene Springs	15	91	28	63	77.4	1.77	2	90	31	45	64.6	1.38
Fish River	10, 20, 22	88	30	64	78.2	5.20	17	88	30	48	69.4	1.45
Averages	......	......	......	......	76.9	2.95	......	......	......	......	65.2	1.78

Meteorology of 1867—Continued.

Stations in States and Territories.	SEPTEMBER.						OCTOBER.					
	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
FLORIDA.												
		Deg.		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
Jacksonville	3, 10	93	26	73	80.8	14.60	2, 12	52	31	28	73.9	4.70
Port Orange	3	88	15	73	80.4	......	1, 3	85	30, 31	58	75.3	......
Averages	....	......	....	......	80.6	14.60	....	......	....	......	74.6	4.70
TEXAS.												
Columbia	9.15	94	24, 29	70	79.8	5.64	1, 3, 4, 5	92	31	48	72.2	2.06
Waco	15	98	24	62	79.6	1.80	4	94	30	43	70.5	2.10
Austin	30	94	11	65	78.4	6.41	4	96	31	45	71.6	2.08
Gilmer	....	......	....	......	......	......	14, 21	87	31	34	65.0	......
Averages	....	......	....	......	79.3	4.62	....	......	....	......	69.8	4.41
LOUISIANA.												
Benton	15, 19	87	11	62	77.8	......	3	86	31	38	67.8	......
MISSISSIPPI.												
Grenada	14, 15, 17, 18, 19, 27	90	23	61	......	......	2	90	31	33	66.1	......
Fayette	2	87	23	62	73.5	......	2	80	31	28	59.5	......
Natchez	20	86	23	66	74.1	2.55	2	85	31	42	68.3	0.70
Averages	....	......	....	......	73.8	2.55	....	......	....	......	64.6	0.70
TENNESSEE.												
Tusculum College	19	89	30	55	71.2	......	4	80	31	33	55.8	......
Lookout Mountain	20	91	30	62	74.0	......	3	88	31	34	62.5	......
Clarksville	19	91	11, 30	52	71.9	0.55	2, 3	87	31	33	69.6	1.98
Franklin	19	96	23	54	75.0	0.00	3	89	31	31	61.5	......
Memphis	19, 20	92	10, 30	60	75.5	2.23	3	88	31	33	61.9	1.87
Averages	....	......	....	......	73.5	0.93	....	......	....	......	62.3	1.92
KENTUCKY.												
Chilesburg	17, 18	96	30	44	70.4	1.17	2	88	24	34	54.4	0.78
Lexington	19	91	30	46	69.0	0.16	2	83	31	34	58.0	0.77
Danville	....	......	....	......	......	......	3	90	24	36	60.4	0.70
Louisville	19, 20	95	11, 12	46	72.0	1.00	2	89	24	28	57.0	0.74
Averages	....	......	....	......	70.5	0.78	....	......	....	......	57.5	0.75
OHIO.												
New Lisbon	18	95	28	36	66.3	0.21	19, 20, 21	80	25	25	51.6	2.74
Steubenville	20	94	30	43	......	0.30	....	......	....	......	......	......
Painesville	19	86	30	40	63.8	1.88	19	79	31	35	53.0	4.50
Milnersville	9	92	27	32	65.0	0.53	18	82	24	22	50.0	2.33
Cleveland	9	88	27, 70	39	63.7	1.38	19	81	24	32	53.6	3.56
Wooster	17	92	11, 30	44	68.7	......	19	86	24	29	54.2	......
Kelley's Island	17	89	30	47	66.8	0.84	20	78	23	38	56.7	1.68
Norwalk	5, 16, 18	90	30	37	67.7	0.18	19, 20	82	24	28	53.9	1.63
Carson	16	94	30	40	66.5	0.24	....	......	....	......	......	......
North Fairfield	17, 18	94	30	42	71.5	......	18	84	24, 30	30	54.1	1.65
Williamsport	....	......	....	......	......	......	27	76	7	29	47.3	4.26
Marion	17	89	30	39	64.4	0.61	18, 19	78	24	26	52.0	2.56
Hillsboro'	20	88	30	42	67.1	0.30	2	60	30	33	54.0	3.07
Toledo	5	88	27	39	62.4	2.00	19, 20	78	24	30	53.6	2.88
Bowling Green	16, 18	96	27	32	63.7	2.50	18	89	24	22	53.9	2.30
Kenton	19	100	10, 30	55	73.7	2.00	19	86	24	39	57.9	6.25
Urbana	19	91	30	42	68.1	0.32	18, 19	80	24	30	54.7	2.01
Bethel	19	93	30	40	68.0	0.50	2	85	24	32	50.8	2.25
Cincinnati	19	93	30	43	70.5	0.47	18, 20	80	30	35	55.0	2.05
Do	19, 20	94	11	52	74.4	0.65	2, 18	81	30	44	60.4	3.10
College Hill	19	97	30	45	72.1	......	2	87	30	35	57.2	1.63
Averages	....	......	....	......	67.7	0.86	....	......	....	......	53.9	2.80

Meteorology of 1867—Continued.

Stations in States and Territories.	SEPTEMBER.						OCTOBER.					
	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
MICHIGAN.		*Deg.*		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
Monroe City	17	94	30	38	65.7	......	18	86	23	36	55.9	1.87
State Agr'l College	17	87	30	27	56.6	1.41	19	79	24	22	50.7	2.11
Litchfield	16, 17	87	30	36	61.9	1.73	19	82	24	31	52.5	3.89
Grand Rapids	17	91	30	36	64.7	......	19	84	23, 24	28	52.8	......
Northport	16	86	26	42	60.0	......	20	80	23	32	51.6	......
Otsego	19	92	30	40	64.0	......	20	84	23	32	54.0	......
Copper Falls	16	78	29	30	53.2	8.30	20	75	3, 19, 22	32	45.5	2.60
Ontonagon	16, 17	80	30	36	56.4	......	20	76	3, 4, 22	32	47.2	......
Averages	......	......	......	......	60.3	3.81	......	......	......	......	51.3	2.62
INDIANA.												
Richmond	17, 19	90	30	40	65.9	0.17	2, 18	78	24	30	52.0	2.72
Aurora	19	97	30	43	71.8	0.88	2	84	24	32	53.8	2.01
Vevay	19	98	30	42	74.0	0.77	2, 20	90	24	28	57.9	1.04
Muncie	17, 19	92	30	40	67.2	0.25	2	82	24	31	54.4	2.85
Spiceland	19	93	30	42	67.5	0.50	2	82	23	32	54.1	2.70
Columbia City	16, 17	90	30	34	62.6	......	17, 18	80	24	26	49.5	0.48
Indianapolis	19	93	23	38	67.2	0.34	1	82	30	30	53.4	2.61
Merom	25	84	30	45	69.6	2.70	2	82	31	31	54.8	2.10
New Harmony	19	90	30	50	71.8	0.65	2	85	30	34	50.7	0.81
Averages	......	......	......	......	68.6	0.78	......	......	......	......	53.4	1.92
ILLINOIS.												
Chicago	17	92	11, 30	51	67.9	0.57	19	90	30	32	57.8	......
Near Chicago	17	97	30	50	67.6	......	19	81	30	35	56.8	1.28
Golconda	19	98	22	50	75.7	0.60	3, 20	89	30	28	55.9	0.90
Aurora	17	88	30	42	63.2	2.54	19	82	24	26	52.4	1.2
Sandwich	18	91	30	38	63.6	1.80	18	80	24	24	51.4	0.4
Ottawa	19	96	30	44	67.5	0.11	19	87	23, 24	34	54.5	0.92
Winnebago	17	90	30	34	63.4	1.53	19	84	23, 30	27	52.4	0.50
Rochelle	17	92	30	36	64.0	......	18, 19, 20	81	23	25	51.0	......
Wyanet	17	91	30	40	68.0	1.36	18	85	24	28	55.1	0.97
Tiskilwa	16	88	30	36	64.2	......	18, 19	80	24	28	52.1	......
Hennepin	17	93	30	37	67.0	......	19, 20	85	24	28	56.0	......
Elmira	19	90	30	39	65.7	0.82	18, 19	83	23, 24	31	52.9	0.92
Peoria	19	92	30	45	68.1	0.60	19	84	24	30	55.3	1.10
Springfield	20	98	30	43	67.3	......	18	84	24	26	56.2	......
Loami	18	94	30	37	69.2	......	18	86	24	28	55.6	2.00
Dubois	......	......	......	......	......	......	18	84	31	26	58.5	1.20
Nashville	14, 9	98	11	42	73.1	0.12	......	......	......	......	......	......
Waterloo	18	95	10, 30	53	75.8	......	2	94	30	35	61.6	......
South Pass	9, 19	92	30	44	72.5	......	......	......	......	......	......	......
Galesburg	19	88	30	43	65.6	0.94	19	82	29, 30	32	53.1	0.95
Manchester	19	91	11	51	70.3	0.50	18, 19	87	28, 29	32	57.6	1.42
Mt. Sterling	16, 17, 19	90	30	46	70.2	0.00	16, 18, 19	83	29	32	57.2	......
Andalusia	17	92	30	40	66.4	......	18	80	23	32	55.4	......
Augusta	19	88	30	34	69.1	1.78	18	80	29	34	56.5	0.99
Averages	......	......	......	......	68.1	0.95	......	......	......	......	55.3	1.06
WISCONSIN.												
Manitowoc	24	81	30	36	59.6	2.85	16	77	23, 29, 31	34	50.6	1.74
Plymouth	17	88	30	32	60.0	5.60	18	77	24	29	48.1	2.10
Milwaukee	17	91	30	40	62.1	1.46	16, 19	80	29, 30	38	52.1	0.80
Do	17	91	30	41	61.8	1.84	......	......	......	......	......	0.84
Appleton	6, 16, 17	86	10	40	63.8	......	17	80	30	38	58.0	......
Geneva	17	90	30	40	58.6	......	19	80	23	28	51.4	......
Delavan	19	88	30	34	62.0	1.24	18, 19	79	23	26	51.0	0.73
Waupacca	17	85	30	35	60.7	......	20	76	23	30	50.1	......
Embarrass	17	90	30	30	58.3	2.08	20	78	23	26	47.5	1.62

Meteorology of 1867—Continued.

Stations in States and Territories.	SEPTEMBER. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	OCTOBER. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
WISCONSIN—Con.												
		Deg.		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
Rocky Run	16, 17	88	30	33	62.4	2.84	18	79	23	24	50.3	1.52
Edgerton	28	98	27	38	63.3	......	19, 20	82	23	26	50.7	1.50
Baraboo	19	98	29	35	67.0	1.00	16	80	30, 31	30	52.2	3.00
New Lisbon	......	......	......	......	......	......	18, 20	80	22	30	50.5	......
Averages	......	......	......	......	61.6	2.36	......	......	......	......	51.0	1.54
MINNESOTA.												
Beaver Bay	24	77	24, 29	33	54.5	9.39	18	64	23	25	43.6	2.20
Grand Portage	16	68	14	38	51.6		......	......	......	......	......	......
St. Paul	16	81	9	40	57.4	5.71	15	73	31	27	47.3	2.02
Minneapolis	16	83	9	44	60.5	5.59	15	72	26, 31	28	47.9	0.92
Sibley	17	87	1, 9, 10	34	60.7	1.61	19	78	31	18	48.5	0.35
New Ulm	16	86	5	47	64.4	3.61	15, 19	78	31	25	51.0	0.99
Averages	......	......	......	......	58.2	5.18	......	......	......	......	47.7	1.30
IOWA.												
Clinton	17	93	30	42	69.4	1.85	15, 19, 20	86	30	30	56.2	0.96
Davenport	16, 17	85	30	42	64.9	9.06	18, 19	79	29	34	53.1	1.56
Dubuque	16	87	30	42	64.8	3.58	19	76	30	28	51.9	1.32
Monticello	16	86	30	38	63.7	2.18	19	79	31	24	51.2	1.15
Fort Madison	17	90	30	37	67.0	1.73	18	81	23, 31	32	55.1	1.30
Guttenberg	15, 17	86	10, 30	36	61.1	......	19	82	23	20	49.6	......
Ceres	16	88	30	42	64.6	......	20	82	30, 31	28	53.2	......
Mount Vernon	16, 17	86	30	41	63.8	......	19	79	30, 31	31	54.2	......
Iowa City	16, 17	87	30	43	66.8	4.62	18	80	13	32	54.5	2.06
Independence	15, 16	88	30	42	58.6	3.00	1, 19	80	31	23	50.4	2.70
Near Independence	......	......	......	......	......	......	18	81	30	21	51.1	2.00
Waterloo	16, 17	86	10	40	63.0	......	19	80	31	26	57.0	......
Marble Rock	16	82	10, 30	44	62.0	......	19	74	31	26	52.1	......
Iowa Falls	15, 16, 17 18, 19	78	10	40	63.2	......	16	74	29, 31	28	51.9	1.82
Algona	28	85	9, 26, 29	43	61.1	......	18	80	23	25	49.5	......
Do.	16, 28	83	26, 30	46	62.0	......	19	80	31	24	50.6	......
Dakota	15, 16, 28	85	6	36	61.4	......	18, 19	79	23, 31	27	50.2	......
Fort Dodge	16	87	9	42	63.2	2.43	18, 19	77	23	29	51.3	1.67
Fontanelle	16	87	10	42	63.9	4.13	1	81	31	29	52.2	3.00
Logan	15, 16	89	10	42	65.6	1.40	7	88	23, 30	28	60.0	2.90
Averages	......	......	......	......	63.7	3.40	......	......	......	......	52.8	1.87
MISSOURI.												
St. Louis	18	91	30	45	71.7	0.28	......	......	......	......	......	......
St. Louis Univers'y	19	92	30	45	71.7	0.28	2	89	30, 31	37	58.3	1.40
Allenton	19	100	11, 30	41	69.2	0.52	2	100	31	24	56.1	1.54
Rolla	14, 19	91	11	38	61.3	0.26	2	92	31	23	55.4	1.50
Hermitage	4	99	30	41	71.5	0.13	2	93	29	28	58.0	2.32
Harrisonville	29	96	11	46	67.1	5.23	1	84	30	30	56.4	1.74
Oregon	8	91	6, 10, 21	49	68.3	3.20	1	91	30	31	56.8	2.10
Averages	......	......	......	......	68.7	1.41	......	......	......	......	56.8	1.77
KANSAS.												
Leavenworth	8	94	30	38	67.2	1.75	1	90	31	26	56.4	2.55
Olatha	18	94	10, 22	50	68.4	1.80	1	89	30	26	55.6	2.00
Baxter Springs	13, 14	98	10	40	73.9	0.10	1	98	30	18	63.3	0.26
Atchison	8	96	10	44	69.1	1.75	1	90	30	29	56.7	0.70
Holton	8	97	6	49	69.4	......	1	94	30	28	54.2	......
State Agr. College	8, 15	92	21	49	68.3	3.49	1	92	30	29	57.5	0.91
Council Grove	8	96	10	42	69.1	2.35	1	93	30	24	58.1	0.05
Averages	......	......	......	......	69.3	1.87	......	......	......	......	57.4	1.08

Meteorology of 1867—Continued.

Stations in States and Territories.	September: Date.	September: Maximum temperature.	September: Date.	September: Minimum temperature.	September: Mean temperature.	September: Rain or melted snow.	October: Date.	October: Maximum temperature.	October: Date.	October: Minimum temperature.	October: Mean temperature.	October: Rain or melted snow.
NEBRASKA.												
		Deg.		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
Elkhorn	16	93	6, 10	46	66. 3	......	19	87	30	26	52. 9	......
De Soto	16	93	6	46	66. 1	1. 82	1	86	30	27	52. 5	1. 07
Glendale	12	95	9	41	66. 5	1. 55	16	87	22, 23	22	52. 2	1. 05
Omaha Agency	......	......	......	......	......	......	19	85	30	30	55. 3	0. 75
Averages	......	......	......	......	66. 3	1. 69	......	......	......	......	53. 2	0. 96
UTAH TERRITORY.												
Great Salt Lake City	4, 6	86	16, 17, 20	44	67. 4	1. 07	14	78	30, 31	34	56. 4	1. 41
Wanship	3, 4	88	17	35	65. 0	......	7	86	10	26	50. 1	......
Averages	......	......	......	......	66. 2	1. 07	......	......	......	......	53. 3	1. 41
CALIFORNIA.												
San Francisco	20	86	5, 16, 13, 29, 30	53	60. 2	0. 03	10	77	22	47	57. 9	0. 53
Monterey	21	95	24, 28	45	61. 3	0. 09	11	84	24	37	56. 2	0. 71
Antioch	9, 21	90	18, 27, 28	58	70. 1	......	......	......	......	......	......	......
Averages	......	......	......	......	63. 9	0. 06	......	......	......	......	57. 1	0. [illegible]
OREGON.												
Albany	1	98	7	42	61. 5	2. 10	......	......	......	......	......	......
Corvallis	1	94	7	40	......	......	11, 13	72	22	24	......	......
WASHINGTON TER.												
Port Townsend	2	81	7	46	57. 0	0. 60	10	64	27	32	49. 0	0. 58

Stations in States and Territories.	November: Date.	November: Maximum temperature.	November: Date.	November: Minimum temperature.	November: Mean temperature.	November: Rain or melted snow.	December: Date.	December: Maximum temperature.	December: Date.	December: Minimum temperature.	December: Mean temperature.	December: Rain or melted snow.
MAINE.												
Steuben	4	56	20	7	34. 4	4. 29	27	44	20	—16	17. 3	6. 10
Williamsburg	......	......	......	......	......	......	28	36	10	—20	9. 5	1. 80
West Waterville	11	54	19	10	32. 6	2. 05	26	44	12	— 7	16. 4	1. 75
Gardiner	2	59	19	12	34. 5	2. 85	26	44	11	— 7	18. 6	1. 89
Standish	10	60	19	4	32. 6	2. 30	26	43	9	— 5	17. 8	1. 49
Cornish	10	61	19, 30	8	32. 2	2. 84	26	43	12	— 9	16. 4	3. 30
Cornishville	2, 10	59	19	10	33. 0	2. 55	26	41	9	— 8	17. 0	2. 18
Averages	......	......	......	......	33. 2	2. 81	......	......	......		16. 1	2. 64
NEW HAMPSHIRE.												
Portsmouth	2	65	19	13	36. 0	2. 60	......	......	......	......	......	......
Stratford	2, 10	60	30	0	28. 6	3. 11	27	39	12	—22	9. 5	2. 75
North Barnstead	10	62	19, 30	12	37. 1	2. 41	26	46	9	— 5	20. 0	1. 49
Claremont	11	65	19	4	34. 8	2. 42	......	......	......	......	......	......
Averages	......	......	......	......	34. 1	2. 64	......	......	......	......	14. 8	2. 12
VERMONT.												
Lunenburg	10	58	30	1	30. 1	2. 50	26, 27	40	19	—25	9. 8	1. 78
North Craftsbury	2, 10	56	7	3	29. 2	2. 22	26	40	12	—14	15. 8	2. 83
Randolph	2	60	19	1	31. 9	1. 22	26	42	11	—16	15. 0	1. 11
Middlebury	10	62	30	7	34. 6	1. 18	26	44	12, 13	—13	13. 0	1. 21
Averages	......	......	......	......	31. 5	1. 78	......	......	......	......	13. 4	1. 7[illegible]

Meteorology of 1867—Continued.

Stations in States and Territories.	November. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	December. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
MASSACHUSETTS.												
		Deg.		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
Kingston	2	66	19	15	42.7	1.28	26, 28	50	19	5	27.8	3.42
Topsfield	3	67	19	17	42.2	2.57	26	47	9, 11	— 3	25.9	1.07
Lawrence	10	63	19	13	38.6	3.73	27, 28	50	9	— 2	22.9	3.45
Georgetown	2	65	19	13	38.3	......	27	50	10	— 6	23.0	1.53
Newbury	2	64	19	13	37.6	......	27	48	9	— 2	22.3	......
Milton	9	70	19	12	35.9	3.80	26	47	9, 19	0	22.9	2.67
North Billerica	10	61	19	12	38.1	......	27	48	11	— 8	22.7	......
West Newton	9	73	19	12	37.0	2.35	26	50	11	— 1	20.1	3.15
New Bedford	9	64	19	16	40.9	3.09	26	51	9	5	26.9	3.90
Worcester	9	68	19	12	38.6	2.19	27	54	14	— 3	23.0	2.07
Mendon	10	63	19	11	37.5	......	27	46	9	— 3	21.0	......
Lunenburg	10	65	19	8	36.0	2.05	28	45	9	— 8	20.7	1.73
Amherst	2, 10	65	19, 30	16	37.9	4.31	26	46	14	— 3	22.6	1.51
Richmond	3	67	18	10	37.1	4.47	27	44	14	—12	19.6	2.63
Williams College	2. 10	63	30	12	36.4	3.39	27	46	14	—11	21.3	1.85
Averages	......	......	......	......	38.4	3.01	......	......	......	......	22.8	2.42
RHODE ISLAND.												
Newport	9	63	19	15	40.0	3.14	26	48	9	2	26.6	5.47
CONNECTICUT.												
Pomfret	9	67	30	14	37.8	4.28	26	46	14	0	22.0	1.86
Groton	9	68	19	17	41.6	2.12	26	54	19	2	24.7	3.15
Columbia	3	62	18	16	39.9	......	26	54	14	— 2	21.7	......
Middletown	2	69	18, 30	19	40.3	2.75	26	53	12	1	24.4	2.49
Colebrook	10	64	18, 30	9	35.1	......	27	44	14	—11	19.1	......
Averages	......	......	......	......	38.9	3.05	......	......	......	......	23.0	2.50
NEW YORK.												
Moriches	2	69	19	21	46.6	2.99	26	59	19	0	31.0	2.98
South Hartford	1, 11	68	18, 30	14	38.9	3.00	26	52	12	—11	19.7	1.30
Troy	2	66	30	15	39.7	1.64	26	47	13	— 3	23.3	1.23
Germantown	2, 10	68	18	18	41.4	3.00	......	......	......	......	......	......
Garrison's	10	63	30	18	42.0	2.60	26	52	13	— 2	25.0	1.58
Throg's Neck	9	67	30	20	44.0	......	26	53	13	5	28.0	......
White Plains	2	67	19, 30	22	45.0	......	7, 28	50	13, 14	3	21.6	......
Deaf & Dumb Inst'n	9	67	19	20	44.1	2.25	26	50	13	6	28.0	2.50
Columbia College	9	64	30	21	42.7	1.61	26, 27	50	12	3	29.0	1.22
St. Xavier's College	9	66	30	22	41.2	1.86	......	......	......	......	......	......
Stapleton	2	71	19	21	45.6	......	26	54	13	7	30.2	1.26
Flatbush	10	62	30	19	46.5	1.96	26	49	13	5	29.8	1.35
Newburgh	9	72	30	20	44.1	2.19	26	52	14	0	27.0	1.34
Minaville	5	71	30	10	37.6	......	27	44	14	—20	13.4	2.47
Gouverneur	10	64	18	5	......	1.81	27	44	19	—19	14.8	0.96
North Hammond	9	62	19	7	35.0	3.17	27	48	12, 13	—12	16.8	2.94
South Trenton	5	71	18	10	36.5	4.86	22, 28	42	14	—22	16.9	9.36
Cazenovia	9	63	18	11	36.9	......	27	46	13	—17	20.0	2.22
Oneida	9	66	18	14	37.9	2.93	27	53	14	—14	21.7	3.74
Houseville	9	60	18, 19	6	33.7	3.62	27	48	9, 12, 13, 19	—14	16.4	3.25
Depauville	9	59	19	8	36.4	2.31	27	46	12	—11	18.6	2.41
There a	......	......	18	1	......	2.57	......	......	19	20	......	1.85
Oswego	9	61	30	16	39.5	1.67	27	49	14	—10	23.4	3.78
Palermo	9	64	18	12	36.6	1.40	27	45	14	—24	19.3	5.73
Nichols	2	66	18, 30	14	39.9	......	27	51	13	—17	24.1	......
Geneva	9	68	30	13	40.0	0.33	26	56	13	— 4	24.7	0.70
Rochester Unive'ty	8	64	30	13	39.0	0.00	......	......	......	......	......	......
Little Genesee	8	65	30	14	37.6	0.60	27	53	14	—18	23.9	2.05
Friendship	9	64	30	12	37.8	1.29	......	......	......	......	......	......
Buffalo	8	63	30	11	41.3	0.85	27	52	14	2	25.6	2.96
Averages	......	......	......	......	40.3	2.11	......	......	......	......	22.9	2.57

Meteorology of 1867—Continued.

Stations in States and Territories.	NOVEMBER.						DECEMBER.					
	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
NEW JERSEY.		Deg.		Deg.	Deg.	In.		Deg.		Deg.	Deg.	In.
Paterson	9	68	19	16	42.4	2.75	26	51	12, 13	5	27.7	2.20
Newark	9	68	19	19	43.4	1.95	26	50	14	2	26.9	2.05
New Brunswick	2	68	19	19	42.7	1.68	26	49	13	7	27.6	1.27
Trenton	9, 10	66	19	27	47.7	2.33	28	52	13	8	32.4	3.24
Burlington	2	66	19	21	46.7	2.70	27	55	14	10	31.8	1.80
Moorestown	9	70	19	18	44.9	2.25	27	54	14	8	28.5	1.83
Mount Holly	9	71	19	21	46.1	......	27	54	14	10	30.5	......
Elwood	9	72	19	14	45.4	......	......	......	......	......	......	......
Seaville	2, 3, 9, 10, 11	68	20	26	46.3	2.61	......	......	......	......	......	......
Dover	10	63	19, 30	19	41.5	1.15	26	49	13	1	27.1	3.00
Haddonfield	9	72	19	23	45.6	2.38	27	56	14	9	29.9	3.95
Newfield	9	75	19	15	46.6	......	26, 28	55	13, 14	11	34.1	......
Greenwich	9	72	19	19	46.8	1.24	26	52	13, 14	13	31.9	0.89
Vineland	9	77	19	16	45.7	1.49	25	53	13, 19	10	30.2	2.26
Averages	......	......	......	......	45.2	2.14	......	......	......	......	29.9	2.25
PENNSYLVANIA.												
Nyces	2	65	30	11	38.6	2.10	26	51	14	—22	22.9	2.34
Fallsington	2	68	19	20	44.7	1.90	27	49	14	9	29.0	3.50
Philadelphia	9	68	19	25	47.0	2.54	27	52	14	10	31.7	2.86
Germantown	10	63	19	14	49.9	......	28	50	13	7	28.1	......
Horsham	9	71	19	18	44.3	2.30	27	47	14	6	28.1	1.20
Dyberry	2, 8	64	30	12	37.2	1.30	26, 27	46	14	—27	21.3	1.85
Lehigh University	9	67	19, 20, 30	20	43.1	......	26	46	14	0	26.7	......
Whitehall	9	66	20	19	42.4	......	26	48	14	— 7	27.3	1.38
Reading	9	71	30	23	45.4	......	27	51	14	1	29.6	......
Parkesville	9	70	30	22	45.2	1.67	26	50	13	5	27.8	2.81
Ephrata	9	72	30	22	47.2	0.57	28	50	14	4	28.7	2.47
Mount Joy	......	......	......	......	......	......	27	50	14	3	31.0	......
Harrisburg	2	66	30	24	44.4	0.89	27	48	14	4	28.5	1.05
Tioga	2	71	20	17	42.9	1.33	27	56	14	—14	27.5	2.86
Lewisburg	2	67	18, 30	19	41.0	1.40	27	48	14	—23	26.0	2.77
Ickesburg	......	......	......	......	......	......	27	56	13	—14	26.0	1.80
Grampian Hills	2	64	30	8	36.6	2.16	22, 25, 27	44	13	— 6	22.1	4.54
Franklin	2, 8	66	30	14	40.6	......	27	62	13	—10	26.5	......
Connellsville	8	69	30	10	43.1	......	27	68	13	— 9	29.4	......
Beaver	2	65	30	19	43.2	1.40	27	61	13	2	31.1	......
New Castle	2	68	30	20	45.8	......	27	61	13	1	28.3	......
Canonsburg	8	76	30	10	42.4	1.19	......	......	13	—15	24.0	2.02
Averages	......	......	......	......	43.3	1.60	......	......	......	......	27.3	2.39
MARYLAND.												
Woodlawn	2	72	19	17	45.8	2.32	28	54	12, 13	6	29.2	2.41
Catonsville	10	70	30	24	45.2	......	28	50	13, 14	6	28.3	......
Annapolis	9	71	19	24	48.4	2.37	27	61	13, 14	14	39.2	2.98
St. Inigoes	......	......	......	......	......	......	28	62	13	13	36.1	......
Emmittsburg	2, 8	72	30	18	44.9	......	27	55	14, 19	10	29.2	......
Mt. St. Mary's Col'ge	2	67	30	18	43.3	1.18	27	52	14	9	29.7	3.01
Averages	......	......	......	......	45.5	1.96	......	......	......	......	31.5	2.80
VIRGINIA.												
Surry Courthouse	9	80	30	26	52.3	......	27	71	13	18	40.7	5.18
C. Cha's Lighthouse	2	74	30	24	52.5	2.78	26	60	13	20	34.5	2.92
Lynchburg	2, 8, 10	66	30	27	51.4	......	28	61	1	19	39.5	......
Snowville	3	70	30	12	42.6	2.75	27	64	1	6	34.8	1.69
Averages	......	......	......	......	49.7	2.77	......	......	......	......	37.4	3.30
WEST VIRGINIA.												
Romney	8	78	30	20	47.5	......	27	62	14	6	34.0	......
Grafton	8	75	30	16	47.9	1.50	22	60	13	6	35.9	3.59

Meteorology of 1867—Continued.

Stations in States and Territories.	NOVEMBER.						DECEMBER.					
	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
W. VIRG'A—Con.												
		Deg.		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
Cabell Court House	9	68	30	19	46.5	1.60	27	74	1	14	39.4	4.60
Averages	......	......	......	......	47.3	1.55	......	......	......	......	36.4	4.05
NORTH CAROLINA.												
Goldsboro'	3, 10	82	6	31	55.3	2.15	28	75	14	19	45.0	2.75
Raleigh	3	74	30	25	48.1	2.70	28	73	14, 16	17	41.7	2.95
Oxford	2, 3, 9	70	13, 20	30	50.3	2.50	28	66	14	14	39.0	4.00
Albemarle	3	80	6	22	51.4	1.92	28	76	9	13	43.3	5.40
Statesville	3	70	6, 20	24	45.9	0.50	28	68	1, 9	12	38.8	2.50
Asheville	3	72	30	17	47.8	......	27, 28	67	13	13	41.1	......
Averages	......	......	......	......	49.8	1.95	......	......	......	......	41.5	3.52
SOUTH CAROLINA.												
Aiken	2	75	13	32	56.9	2.61	26	75	13	28	49.9	......
Gowdysville	2	72	6, 13, 30	31	53.9	......	28	78	1	21	49.2	......
Averages	......	......	......	......	55.4	2.61	......	......	......	......	49.6	......
ALABAMA.												
Opelika	2	75	30	28	52.8	......	27	75	1	25	52.6	......
Carlowville	3, 8	76	30	30	57.3	3.87	27	78	1	30	56.3	3.80
Moulton	2	71	30	23	50.9	2.56	27	70	1	22	47.7	3.35
Prairie Bluff	8	79	30	30	58.0	......	......	......	......	......	......	......
Green Spring	8	77	30	28	56.2	3.83	27	77	1	28	54.5	2.41
Fish River	23	92	30	31	60.9	2.59	6, 28	76	1	32	......	2.20
Averages	......	......	......	......	56.0	3.21	......	......	......	......	52.8	2.94
FLORIDA.												
Jacksonville	4	85	13, 30	42	64.2	0.40	27	80	1	35	60.1	0.93
Port Orange	8, 9	82	13	46	67.9	......	6, 7	80	1	42	64.8	......
Gordon	9	84	13	38	64.0	......	6, 28	78	9	35	59.5	......
Lake City	......	......	......	......	......	......	25	76	14	32	57.8	......
Averages	......	......	......	......	65.4	0.40	......	......	......	......	60.6	0.93
TEXAS.												
Columbia	1	86	30	29	62.1	3.19	2	87	31	31	65.7	2.36
Waco	8	82	30	24	58.2	1.10	11	85	31	20	61.7	2.30
Austin	9	83	30	28	59.4	2.98	11	86	31	28	61.2	1.80
Gilmer	8	83	30	24	58.5	......	25	85	31	30	58.9	......
Averages	......	......	......	......	59.6	2.42	......	......	......	......	61.9	2.15
LOUISIANA.												
Benton	2	76	30	28	57.3	......	26	84	31	30	58.7	......
New Orleans	27	78	30	42	......	......	4, 27	78	31	42	61.2	1.80
Averages	......	......	......	......	57.3	......	......	......	......	......	60.0	1.80
MISSISSIPPI.												
Grenada	14	80	30	24	61.8	......	22	84	13	29	55.8	......
Fayette	8	73	30	23	49.9	......	27	70	31	18	49.1	......
Natchez	3	76	30	30	57.9	5.53	6, 17	79	31	30	60.9	2.52
Averages	......	......	......	......	56.5	5.53	......	......	......	......	55.3	2.52
TENNESSEE.												
Tusculum College	8	73	30	17	42.2	......	27	70	13	15	42.0	......

Meteorology of 1867—Continued.

Stations in States and Territories.	NOVEMBER.						DECEMBER.					
	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
TENNESSEE—Con.		*Deg.*		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
Lookout Mountain	2, 3	74	30	12	52. 6	......	27	70	13	18	43. 6	......
Clarksville	2	75	30	15	49. 6	5. 94	27	73	13	21	42. 1	4. 25
Nashville	8	71	30	18	48. 2	......	27	68	13	24	43. 7	......
Franklin	2	80	29	16	50. 7	......	27	70	14	25	45. 2	......
Memphis	2	77	30	18	53. 0	3. 59	27	76	13, 19, 31	26	47. 4	1. 81
Averages	......	......	......	......	49. 4	4. 77	......	......	......	......	44. 0	3. 03
KENTUCKY.												
Chilesburg	2, 8	72	30	10	46. 5	3. 01	11	57	13	10	35. 3	6. 24
Lexington	8	73	30	11	42. 0	4. 35	27	67	1, 13	11	39. 0	6. 69
Danville	2	75	30	14	51. 1	3. 52	27	74	9, 13	15	41. 2	5. 14
Louisville	8	75	30	11	47. 7	4. 56	27	70	13	8	36. 5	5. 62
Averages	......	......	......	......	46. 8	3. 86	......	......	......	......	38. 0	5. 92
OHIO.												
New Lisbon	8	70	30	10	42. 1	1. 15	25, 27	68	13	—13	39. 7	2. 90
Steubenville	8	70	30	20	44. 7	1. 33	27	66	13, 14	8	31. 0	......
Do.	2	68	30	17	44. 5	......	......	......	......	......	......	......
Painesville	8	65	30	14	43. 3	2. 43	27	59	14	6	27. 0	6. 05
Milnersville	2	70	30	12	37. 6	0. 93	27	58	13	— 1	32. 8	3. 55
Cleveland	8	68	30	15	43. 6	2. 87	25, 27	55	13	— 4	28. 0	3. 16
Wooster	8	68	30	13	43. 9	......	27	66	13	—13	29. 2	......
Kelley's Island	1	66	30	17	44. 9	1. 31	27	51	12	9	28. 9	2. 33
Norwalk	8, 25	67	30	14	44. 2	1. 20	25	59	13	— 3	28. 9	3. 09
Carson	8	68	30	7	45. 7	2. 18	......	......	......	......	......	......
North Fairfield	1	72	30	12	44. 9	1. 75	27	60	19	3	......	......
Williamsport	2	76	30	20	43. 7	4. 11	27	73	13	10	32. 0	9. 04
Marion	8	76	30	12	41. 7	2. 87	27	61	13	6	27. 8	4. 10
Hillsboro'	8	68	30	10	44. 7	2. 74	27	63	13	9	30. 7	3. 83
Toledo	8	65	30	13	43. 4	2. 00	27	60	13	2	28. 3	3. 28
Bowling Green	8	69	30	13	44. 0	2. 71	27	64	19	3	29. 7	2. 55
Kenton	2	70	30	28	49. 0	5. 91	6, 27	60	7, 30	10	37. 3	5. 06
Urbana University	2	71	30	8	45. 1	2. 14	27	64	13	4	28. 6	4. 09
Bethel	8	71	30	8	42. 8	2. 50	27	64	13	6	31. 5	5. 50
Cincinnati	1, 2	65	30	13	45. 0	2. 20	25	58	13	10	32. 8	3. 67
Do.	2, 8	70	30	20	50. 3	2. 66	27	68	13	18	37. 4	3. 66
College Hill	3	70	30	8	45. 5	3. 63	27	66	13	8	33. 6	5. 40
Averages	......	......	......	......	44. 4	2. 43	......	......	......	......	31. 3	4. 15
MICHIGAN.												
Monroe City	8	72	30	10	43. 3	1. 50	27	58	19	— 2	26. 9	2. 13
Alpena	......	......	......	......	......	......	6	40	7	11	23. 8	1. 88
State Agric'l Coll.	8	66	30	7	40. 4	1. 77	27	50	13	0	25. 3	1. 34
Litchfield	1, 3, 8	64	30	6	40. 5	3. 30	25	51	13	— 8	24. 0	1. 42
Grand Rapids	1, 8	64	30	10	41. 5	......	25	47	15	0	24. 8	......
Northport	8	66	30	10	39. 7	......	25	43	12	8	23. 8	0. 58
Otsego	24	80	30	18	45. 4	......	25	58	13	2	30. 0	......
Holland	1	78	30	12	44. 1	3. 14	25	55	15	— 3	27. 7	2. 24
Copper Falls	1	51	29	— 4	29. 3	2. 10	......	......	......	......	......	......
Ontonagon	7	58	29, 30	10	34. 6	......	25	34	8	4	18. 1	......
Averages	......	......	......	......	39. 9	2. 36	......	......	......	......	25. 8	1. 60
INDIANA.												
Richmond	2	69	30	6	42. 2	2. 63	......	......	......	......	......	......
Aurora	8	73	30	8	43. 7	3. 40	27	69	15	3	32. 9	4. 00
Vevay	8	77	30	10	47. 0	3. 50	27	72	15	11	34. 9	6. 40
Muncie	2, 8	70	30	5	44. 0	......	25, 27	57	15	— 5	29. 5	2. 40
Spiceland	2	71	30	4	43. 9	2. 35	27	61	15	0	30. 1	3. 40
Columbia City	8	66	30	5	40. 3	3. 38	25, 26	60	13	5	26. 4	0. 88
Indianapolis	8	67	30	10	43. 2	2. 78	27	63	15	— 2	30. 4	3. 49

Meteorology of 1867—Continued.

Stations in States and Territories.	NOVEMBER.						DECEMBER.					
	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
INDIANA—Cont'd.												
		Deg.		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
Merom	2, 8	68	30	3	46.0	2.55	27	61	13	7	31.0	4.40
New Harmony	2	73	29, 30	11	43.3	3.13	25, 27	65	13	15	36.7	3.24
Averages	......	......	......	......	41.3	2.97	......	......	......	......	31.5	3.53
ILLINOIS.												
Chicago	1	69	30	6	44.8	1.89	25	60	23	4	28.4	......
Near Chicago	1	73	30	0	43.1	......	25	58	23	10	31.6	1.11
Ridge Farm	......	......	......	......	......	......	27	60	13	6	31.0	......
Golconda	4	72	30	10	45.4	3.20	27	72	15	15	39.5	1.60
Aurora	1	68	30	1	39.3	2.17	25	52	23	0	26.0	1.29
Sandwich	1	67	30	1	40.0	1.59	10	40	23	−5	23.8	1.10
Ottawa	1	74	29	9	42.1	1.12	24	48	23	7	26.9	1.66
Winnebago	1	68	30	−2	40.1	1.68	25	45	23	−6	21.1	1.03
Rochelle	1	70	30	−3	39.0	......	25	45	23	−5	23.0	......
Wyanet	1	72	30	4	43.9	2.40	25	56	23	0	25.6	1.05
Tiskilwa	1	70	30	3	42.1	......	24, 25	50	23	4	27.2	......
Hennepin	1	70	30	4	43.0	......	25	55	23	2	27.0	......
Elmira	1	71	30	0	42.4	2.00	25	50	23	2	26.1	1.25
Peoria	1	72	30	3	44.6	1.93	25	52	23	7	28.6	1.21
Springfield	2	80	30	2	46.7	......	31	74	14	10	31.8	......
Dubois	2	74	30	−1	46.3	2.30	21, 26	60	18	17	35.0	3.45
Waterloo	2	76	30	10	50.5	......	25	70	18	12	36.8	......
Galesburg	1	69	30	2	42.6	1.45	11	60	18	9	28.0	0.96
Manchester	2	73	30	2	45.6	1.60	25	65	18	9	30.7	1.01
Mt. Sterling	1	75	30	−1	45.4	......	25	58	18	6	30.2	......
Andalusia	1	68	30	−6	44.2	......	......	......	......	......	......	......
Augusta	2	70	30	−12	46.1	1.33	25	54	18	4	30.0	1.30
Averages	......	......	......	......	43.7	1.90	......	......	......	......	29.0	1.39
WISCONSIN.												
Manitowoc	8	62	30	−3	38.9	1.88	25	47	7, 29, 30	2	24.0	1.18
Plymouth	1, 8	61	30	−2	37.0	3.50	25	42	7, 8, 23	−1	20.0	2.05
Milwaukee	1	67	30	1	40.8	1.53	3	56	23	3	25.7	1.51
Appleton	17	72	30	−6	40.1	......	25	46	7	0	21.4	1.24
Appleton Univer'y	1, 7	59	30	−6	39.5	0.71	......	......	......	......	......	......
Geneva	1	67	30	0	40.1	......	25	47	23	2	28.3	......
Delavan	1	65	30	−4	39.0	1.74	25	47	23	−1	22.5	0.92
Waupacca	1, 2, 7, 8	60	30	−6	38.1	......	25	42	31	−9	20.9	......
Embarrass	8	58	30	−8	34.7	2.00	24, 26	32	18	−22	18.8	2.40
Rocky Run	1	65	29	−3	38.3	1.50	25	44	23	−6	21.1	1.40
Edgerton	1, 8	66	30	−5	39.7	1.90	24, 25	48	23	−4	21.7	......
Baraboo	1	65	30	−2	40.9	3.84	24	41	23, 30	−6	19.7	3.19
New Lisbon	22	75	30	−8	37.3	......	24	46	30	−11	19.3	......
Galesville	......	......	......	......	......	......	26	37	30	−18	......	......
Averages	......	......	......	......	38.8	2.07	......	......	......	......	21.5	1.74
MINNESOTA.												
Beaver Bay	8	50	30	−14	31.4	0.49	25	34	7	−18	13.8	0.71
St. Paul	1	65	30	−6	34.1	0.58	2, 9, 25	33	30	−14	15.5	0.84
Minneapolis	1	63	30	−6	34.2	0.68	25	34	30	−16	14.9	1.09
Sibley	13	67	30	−11	36.4	......	26	38	18	−22	14.1	0.80
New Ulm	1	68	30	−8	37.4	0.13	9	44	18	−20	16.1	0.35
Averages	......	......	......	......	34.7	0.47	......	......	......	......	14.9	0.76
IOWA.												
Clinton	......	......	......	......			25	50	23	4	27.0	2.32
Davenport	1	67	30	3	41.7	4.42	25	45	23	−1	22.8	2.22
Dubuque	1	64	30	0	40.2	1.38	25	42	23	−2	23.3	1.13

Meteorology of 1867—Continued.

Stations in States and Territories.	NOVEMBER. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	DECEMBER. Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
IOWA—Continued.		Deg.		Deg.	Deg.	In.		Deg.		Deg.	Deg.	In.
Monticello	1	68	30	3	37.3	0.90	2, 24	40	23	4	21.2	0.65
Fort Madison	1	68	30	— 1	43.8	1.72	25	52	18	5	27.2	1.15
Guttenberg	1, 13	68	30	— 3	37.9	......	24	44	23	— 6	19.1	0.53
Ceres	7, 13	66	29	2	40.5	......	2, 25	50	22	3	22.5	......
Mt. Vernon	1	76	30	— 1	40.2	......	24	42	23	— 2	22.3	......
Iowa City	1	72	30	0	41.6	1.97	24	44	23	— 2	24.3	1.34
Independence	1	69	30	— 3	37.6	0.20	25	44	23	— 4	19.3	0.60
Near Independence	1	70	30	— 7	37.4	0.30	25	41	23	— 7	20.7	1.40
Waterloo	1, 13, 15, 21	68	30	0	39.7	......	10	42	23	0	22.1	......
Marble Rock	1	69	30	— 6	40.6	......	25	43	30	— 5	20.7	......
Iowa Falls	8	68	30	— 4	35.0	0.14	10	44	28	— 4	23.5	2.46
Algona	1	72	30	— 6	37.2	......	9	48	18	—11	18.8	......
Do	1	62	30	—10	30.4	1.05	9, 26	38	18	—16	13.4	1.10
Dakota	1	72	30	— 5	37.5	......	9	47	18	— 8	19.7	......
Fort Dodge	1	70	30	— 1	39.2	0.02	10	46	18	— 4	21.8	1.32
Boonsboro'	7	71	30	2	39.6	......	15	46	17, 18	— 9	23.1	1.20
Fontanelle	1, 7, 13	71	30	— 2	40.1	......	26	58	18	— 4	26.8	1.45
Logan	1, 7, 13, 22, 23	70	29, 30	3	41.5	0.10	10	54	18	— 3	26.2	0.80
Averages	......	......	......	......	39.0	1.11	......	......	......	......	22.2	1.31
MISSOURI.												
St. Louis Univer'y	2	73	30	11	49.0	2.09	25	70	18	14	36.0	2.91
Allenton	2	84	30	— 5	45.0	2.24	25	73	18	10	36.1	2.59
Rolla	2	80	30	— 9	44.0	2.08	25	75	18	9	39.3	1.44
Hermitage	2	80	30	— 8	45.5	1.63	24	67	18	8	38.6	0.69
Harrisonville	2	76	30	8	46.1	0.86	26	64	18	7	34.5	0.99
Oregon	1	77	30	3	46.0	0.40	16	72	18	5	34.0	1.40
Averages	......	......	......	......	45.9	1.55	......	......	......	......	36.4	1.67
KANSAS.												
Leavenworth	17	80	30	5	43.7	1.31	26	64	18	6	34.1	0.71
Olatha	1	76	29	4	45.0	......	26	66	18	8	29.0	0.13
Baxter Springs	2	87	30	2	50.5	2.30	26	76	31	10	42.6	0.40
Atchison	1, 7	76	30	4	43.0	0.13	16, 26	62	18	6	33.1	0.40
Holton	7	78	29	3	43.5	......	16	72	18	4	33.1	......
State Ag. College	2	96	29	7	45.1	0.49	26	64	30	15	35.1	0.51
Council Grove	1, 7	78	29	7	45.4	1.30	16	67	18, 31	8	37.0	0.50
Averages	......	......	......	......	45.2	1.11	......	......	......	......	34.9	0.44
NEBRASKA.												
Elkhorn	7	76	29	1	40.9	0.05	10	58	18	— 2	27.2	0.35
De Soto	7	73	29	5	40.0	0.03	5	55	18	— 3	25.7	0.62
Glendale	1	78	29	— 7	38.9	0.05	10	68	17, 18, 30	2	27.7	0.85
Dakota	13	72	29	5	39.7	......	15	50	18	— 6	25.1	0.60
Omaha Agency	......	......	......	......	......	......	5	52	18	— 4	29.0	0.80
Averages	......	......	......	......	39.9	0.04	......	......	......	......	26.9	0.64
UTAH TERRITORY.												
Gt. Salt Lake City	......	......	......	......	......	......	9	60	29	20	41.2	3.65
Wanship	5	63	4	20	39.1	0.80	15	56	29	— 2	35.1	3.70
Averages	......	......	......	......	39.1	0.80	......	......	......	......	38.2	3.68
CALIFORNIA.												
San Francisco	12	68	2, 3, 7, 8	51	56.1	3.38	4	66	29	42	53.7	10.77
Monterey	12	81	8	38	54.8	0.28	5	73	28, 29	33	54.3	6.71
Antioch	1	73	29	40	56.4	2.67	10	67	28	35	53.9	9.67
Averages	......	......	......	......	55.8	2.11	......	......	......	......	54.0	9.05

Meteorology of 1867—Continued.

Stations in States and Territories.	NOVEMBER.						DECEMBER.					
	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.	Date.	Maximum temperature.	Date.	Minimum temperature.	Mean temperature.	Rain or melted snow.
		Deg.		*Deg.*	*Deg.*	*In.*		*Deg.*		*Deg.*	*Deg.*	*In.*
MONTANA TERR'Y.												
Helena	......	......	......	......	......	......	14	58	17, 18	— 6	25.2	6.90
OREGON.												
Corvallis	......	......	......	......	......	......	13	66	29	20	......	......
WASHINGTON TER.												
Port Townsend	5	56	4	34	44.3	1.11	4	52	27, 28	26	41.0	3.60

LIST OF DONATIONS TO AGRICULTURAL MUSEUM.

Name.	Residence.	Articles.
J. M. Shaffer	Fairfield, Iowa	Skins of pelican, crane, and field mice; insects.
I. S. Diehl		Six samples of petroleum; Angora wool, Osborn, Ohio; yarns and colors; Angora stockings; cocoons and eggs of silk-worm, (*B. mori*,) from Angora, Asia Minor.
W. Watson	Brenham, Texas	Specimens of petrified wood.
Louis Perrot	Greenville, Wis	Skins of birds and animals; wild cat; insects.
W. N. Byer	Denver, Colorado	Samples of wheat.
D. & H. Leonard	Burlington, Iowa	30 varieties of apples.
B. Palmerton	Etna, Ohio	Sorghum sugar.
Dr. H. Erni	Washington, D. C	Sorghum sugar.
J. H. Richard	Schuylkill, Pa	Fruits of cornus.
A. B. Waller	Newark, Del	Fine samples of corn.
R. B. C. Lee	Duvall's Bluff, Ark	Living scorpions, (three.)
D. L. Perkins	Oakland, Cal	109 varieties California vegetable seeds in show bottles.
B. N. Bugby	Natoma Vineyard, Cal	20 bottles California wines.
Griswold & Sons	Salt Spring Valley, Cal	4 bottles California wines.
Schell & Krause	Knight's Ferry, Cal	4 bottles California wines.
F. A. Perley	Woodbridge, Cal	2 bottles California wines and samples of cotton.
G. S. Wagner	Washington, D. C	Italian queen bee, worker, and drone.
W. T. Steiger	Washington, D. C	Very fine corn.
Charles Lanman	Georgetown, D. C	Birch bark from Labrador pop corn; painting of cotton plant blossoms, bolls, leaves, &c.; sword of sword-fish, and various specimens of natural history.
Mrs. L. M. E. Rich	———, Texas	"Careless weed" and Texas cotton
S. D. Martin	Clark county, Ky	Large hickory nuts.
P. Pulman	Fairfax county, Va	Cotton.
James Neely	Buckingham C. H., Va	Liquor made from corn stalks.
State Department	Washington, D. C	Samples of silk, (Count Bronski,) Asclepias from Peru, sent as a new vegetable silk.
H. D. Dunn	San Francisco, Cal	Oranges and lemons.
Unknown	Marion county, Ohio	Samples of wool.
Unknown	Corea, Russia	Cotton and cloth.
J. Pierce	Washington, D. C	One owl; shells from marl deposit.
Miss Rose Speed	———, Ky	Skin of Troupial.
O. M. Tinkham	New York	California wines and brandy.
C. G. Boerner	———, Ind	Castor beans and section of stalk.
Daniel Tyler	Beaver, Montana Ter	Skin of mountain rat.
J. H. Mumford	Mason City, Iowa	Specimen of native peat.
J. I. Rosenberg	Lansing, Minn	Samples of merino wool.
R. W. Scott	Frankfort, Ky	Samples of Angora wool and fleece, also improved Kentucky wool.
Vilmorin, Andrieux & Co	Paris, France	10 cases of European cereals, 200 specimens.
George Coleman	Washington, D. C	Foreign chestnuts.
William Clough	Cincinnati, Ohio	Eight samples of sorghum
E. W. Rogers	Whallensburg, N. Y	Portrait of merino sheep.
B. Snow, jr	Fitchburg, Mass	Samples of paper from palm-leaf and manilla.

List of donations to agricultural museum—Continued.

Name.	Residence.	Articles.
Mrs. C. A. Meservey	Bridgeville, Del	Samples of silk, spun. floss, and cocoons.
Unknown		Hawk.
Dwight Newton	Robinson, Ill	Fine German wool, presented by John Brown.
Dr. E. H. Clapp	Rome, Peoria co., Ill	Cashmere goats' hair.
Rev. W. B. Raber	Mechanicsburg, Pa	Specimens of corn.
John Steele	———, Utah	Wheat samples, almonds, and sorghum sirup.
E. M. Whittaker	Washington, D. C., (Department of Agricul.)	Specimens of China grass from H. Bonzano, New Orleans, La.
Henry Hilgert	Los Lunas, N. Mexico	Specimens of gold from Cañon del Agua.
Emma F. Averill	Bellevue, Neb	Shells from Big Muddy.
A. Pope	Cahaba, Ala	Specimen toothache bark, (*Aralia nudicaulis.*)
V. Harbaugh	Washington, D. C	Soap bark, (*Quillaya saponaria.*)
J. Q. A. Warren	San Francisco, Cal	Fine photograph of "semi-tropical fruits of California."
Miss Dickens	Washington, D. C	Rosin from prairie weed, large acorn cup from California, and other curiosities.
Hon. A. Dickens	Washington, D. C	Tomahawk from South Sea islands.
H. S. Hall	Putnam, Ohio	Alcohol from sorghum.
Edward Dougherty	Cameron county, Texas	Flax specimens.
Mrs. J. L. McKeen	Galveston	Texas horned toad, (living.)
T. W. Fry	Crawfordsville, Ind	Three varieties of corn.
D. Johnson	Unionville, S. C	Persian tobacco.
W. T. Bingham	Boston, Mass	Wool from Sandwich islands.
B. C. Smith	Brandon, Vt	Ochre paints.
D. C. Ireland	Oregon City	Wheat raised by E. B. Llewellen, large yield and extra heavy weight; salt from Victor Salt Works; paper from straw.
R. W. Clapp	Marlboro', Md	Oyster shell found 100 feet below surface.
Hunt & Gleason	Miami, Fla	Alligators' eggs; insects, specimen in alcohol, &c.; cotton.
E. A. Paul & Co	Wilmington, N. C	Specimens of cotton and tobacco
B. H. True	Madison, Ga	Sample bale of cotton.
Captain Fitch	United States steamer Marblehead.	Specimens in alcohol from the tropics; three South American birds.
E. J. Mears	Winnsboro', S. C	Egyptian grass.
T. T. Wysong	Bell Air, Md	Sassafras growth, (freak of nature.)
J. T. Cox	Kansas	Apples, corn, potatoes, grasses, weeds, &c., from Neutral Lands; gopher and insects.
Miss Antisell	Washington, D. C	Salamander.
Charles R. Dodge	Washington, D. C., (Department of Agricul.)	Framed photograph of insects from South America.
L. Luch & Co	Washington, D. C	Latakia tobacco from Persia.
Dr. Alvord	Washington, D. C	Petrified wood.
E. C. Morrison	Four Mile Run, Va	Petrified wood.
R. E. Talbot	———, Texas	Building stone of Texas, and horned toads.
J. W. Slagle		Insects from Virginia.
John Sherwood	New York	Field corn.
J. S. Battle	Nolensville, Tenn	Orinoco tobacco.
B. L. Lumsden	Eatonton, Ga	Millet.
J. F. Stock	Washington, D. C	Peanuts.
W. T. Lewis	Louisville, Miss	Petrified wood.
A. W. Rhodes	Richmond Factory, Ga	Four stalks of cotton with bolls.
G. W. Atwood	St. Augustine, Fla	Citron, shaddock, oranges, lemons, limes, &c., Florida.

List of donations to agricultural museum—Continued.

Name.	Residence.	Articles.
Dr. Palmer		Specimens from Arizona, seeds, sugar made by Indians, agava, jerked beef, mescal liquor, &c.
Yale College	New Haven, Conn	Insects.
R. T. McLain	Washington, D. C., (Department of Agricul.)	Canadian peat.
Louis Prevost	San José, Cal	Eggs and cocoons of silk-worms.
W. F. M. Arny	Abiquin Indian agency, New Mexico	Piñon seed, Mexican spring wheat, gramma grass, alfalfa, and 20 specimens of minerals.
G. M. Hagans	Morgantown, West Va	Willow roots taken from a well.
John York	Washington, D. C	Seeds of capers, &c.
J. Hopkinson	Edisto Island, S. C	Sea-island cotton.
Theo. Gennert	Chatsworth, Ill	Specimens of beet-root sugar.
Patterson Brothers	Liverpool, England	Sample oats.
G. A. Boardman		Specimens from Florida, coquino, &c.
B. H. Camp	Washington, D. C	Whalebone as taken from the mouth of the whale.
R. J. Meigs	Washington, D. C	Insects.
Hon. G. W. M'Lellan, (per R. J. Meigs.)	Washington, D. C	Guava, sapota, and mammee apple, from West Indies.
Al. S. Newton	Washington, D. C., (Department of Agricul.)	Teasels from New Jersey.
John Parker	Roxbury, Mass	Oats, fine specimen of stalk.
Dr. F. V. Hayden	Pawnee reservations	Native corn.
Gen. N. M. Beckwith		1,442 specimens of seeds, collected in 22 countries of Europe, Asia, Africa, and America, from Paris Exposition.
J. H. Keuling	Washington, D. C	Skins of eagle, Sebright bantam, humming birds, &c.
Smithsonian Institution	Washington, D. C	Leaves of Peruvian coco, &c.
B. Delle Piane	Jackson, La	Egyptian cotton.
John C. Merritt	Farmington, N. Y	Eggs of Busycon, (a sea shell.)
Mrs. M. Rodgers	East Bethany, N. Y	Five-legged frog.
Conrad Bush	Barbour county, Ala	Egyptian cotton.
J. C. Weeks	Napoleon, Mich	Fine sample of sorghum sugar.
Hewes & Warner	Baltimore, Md	Cresylic compound to destroy insects.
W. W. Crane	Brooklyn, N Y	Minerals.
Prof. Townend Glover	Washington, D. C., (Department of Agricul.)	Flying squirrels, &c.
W. H. Hunt	Miami, Fla	Bird skins, swallow-tailed hawk, &c.
R. M. Dyer	Pig River, Va	Botanical specimens.
Unknown		Specimens of hops, foliage, &c.
Ellen C. Long	Tallahasse, Fla	Collection of insects.
C. P. Walker	Rolla, Mo	Seventeen-year locusts.
G. W. Sylvester	Belleville, N. J	Sample grades of petroleum.
Charlwood & Cummins	London, England	Fine samples of wheat.
J. C. Keffer	Montgomery, Ala	Collection of insects in alcohol.
Allen Crocker	Burlington, Kans	Collection of insects, (*Lepidoptera.*)
Rev. R. Williamson	Washington, D. C	Highland moccasin snakes, (alive.)
F. Pech	Washington, D. C., (Department of Agricul.)	Insects.
S. P. Keller	Baltimore county, Md	Specimen of coal, Frederick county, Md.

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